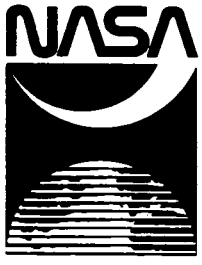
NASA SP-7092

Earth Observations and Global Change Decision Making

A Special Bibliography 1991



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NASA SP-7092
JUNE 1991

Earth Observations and Global Change Decision Making

A Special Bibliography 1991

National Aeronautics and Space Administration
Office of Management
Scientific and Technical Information Program
Washington, DC 1991

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INTRODUCTION

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The first section of the bibliography contains 294 bibliographic citations and abstracts of relevant reports, articles, and documents announced in *Scientific and Technical Aerospace Reports (STAR)* and *International Aerospace Abstracts (IAA). STAR* and *IAA* are semimonthly abstract journals produced for the NASA STI Program that announce aerospace-related, world wide technical reports and journal articles. These abstracts are categorized by 10 major subject divisions, broken down further into 76 specific subject categories, and one general division/category. The Table of Contents contains the complete list of divisions and categories, together with a note for each that defines its scope and provides any cross-references, and the corresponding page numbers. If there are no abstracts in a particular category, N.A. is noted. Following the abstract section, seven indexes are provided to further assist you. They are listed in the Table of Contents and include: subject, personal author, corporate source, foreign technology, contract number, report number, and accession number.

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TABLE OF CONTENTS

N.A.—no abstracts were assigned to this category for this issue.

CHEMISTRY AND MATERIALS

ENGINEERING For related information see also *Physics.*

GEOSCIENCES For related information see also *Space Sciences.*

LIFE SCIENCES

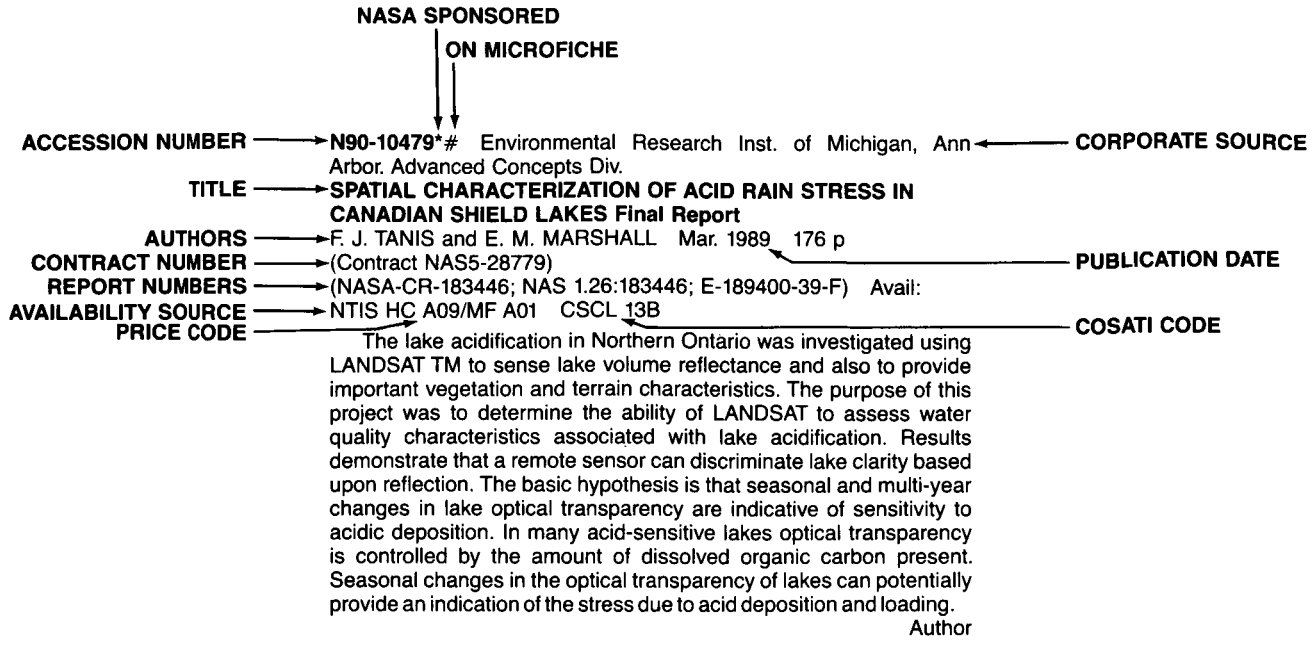
MATHEMATICAL AND COMPUTER SCIENCES

SPACE SCIENCES For related information see also *Geosciences.*

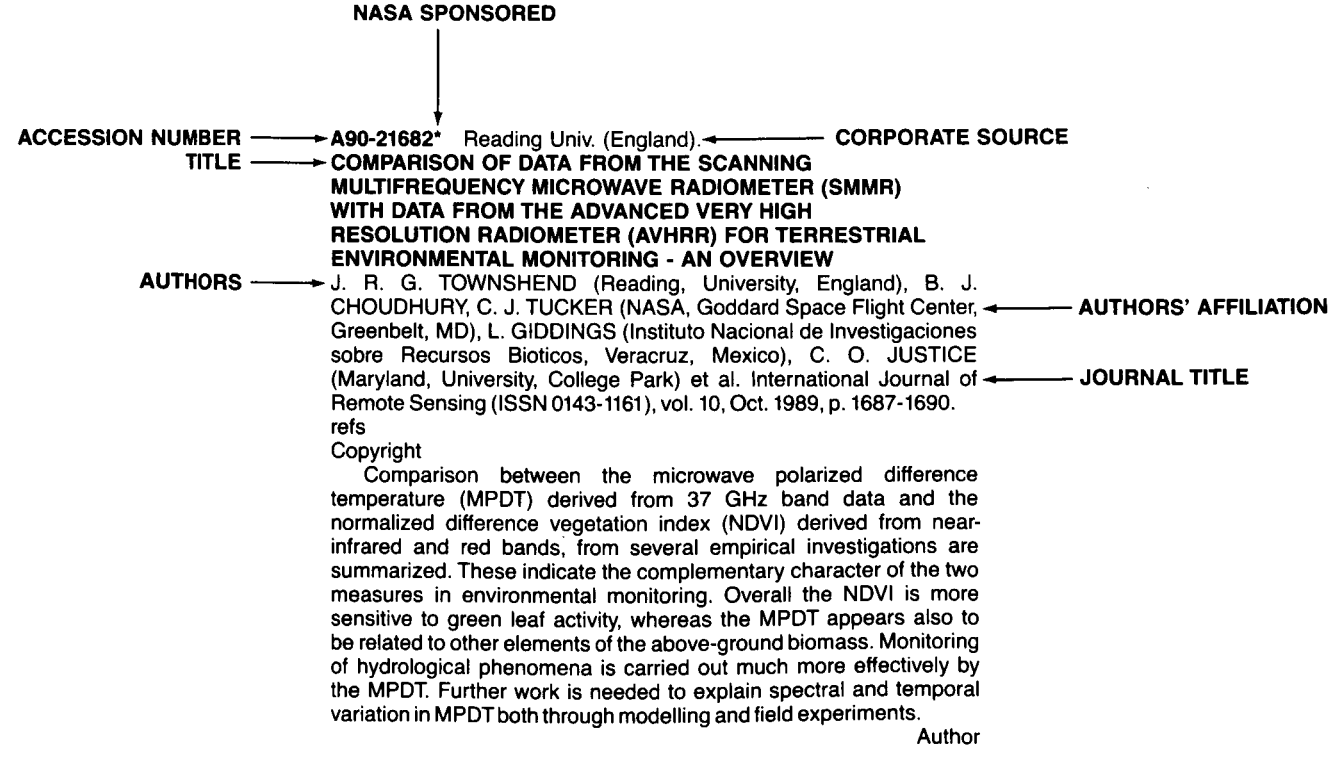
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



EARTH OBSERVATIONS AND GLOBAL CHANGE DECISION MAKING

A Special Bibliography

JUNE 1991

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

N90-13365# Technische Univ., Delft (Netherlands). Faculty of Geodesy.
TEST NETWORK DELFT Thesis
W. H. VANOOIJEN Aug. 1988 109 p
(ETN-90-96009) Avail: NTIS HC A06/MF A01

The accuracy of relative positioning with the Global Positioning System (GPS), using Trimble 4000SX receivers and the Trimble supplied baseline calculation software is tested. The test consists of the comparison of the network measured with the GPS system and the same network terrestrially surveyed with conventional surveying methods. The observations were made at five stations simultaneously. It is shown that it is not allowed to perform a network adjustment using the baselines that close a traverse one. Treatment of the eventually existing misclosure vectors in the closed traverses is studied. A procedure handling the correlated nature of the independently calculated baselines is suggested. The coordinate sets obtained from the GPS measurements and from conventional surveying are compared. It is concluded that there are no biases in the GPS derived coordinates in this network. ESA

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

A90-48868#
SUBSONIC UNMANNED AIR RECONNAISSANCE SYSTEM DESIGN
GERALD A. SWIFT, CHARLES SHEPARD, and KEN SEBEK (USAF, Wright Research and Development Center, Wright-Patterson AFB, OH) AIAA, AHS, and ASEE, Aircraft Design, Systems and Operations Conference, Dayton, OH, Sept. 17-19, 1990. 12 p.
(AIAA PAPER 90-3281)

In 1988, the U.S. Congress mandated the consolidation of all non-lethal Unmanned Air Vehicle (UAV) programs under one UAV Joint Project (UAV JP). The goal of the UAV JP is to reduce the proliferation of UAV systems, reduce the costs associated with redundant development efforts, and to consolidate the individual service requirements for UAVs into a set of joint service requirements. Consolidation of the service requirements has resulted in placing more robust demands on UAV systems so that they will satisfy a variety of user needs. To assist the USAF Tactical Air Command (TAC), the Wright Research and Development Center (WRDC) embarked on a program to identify a UAV system with the robustness required to meet the Unmanned Air Reconnaissance System (UARS) requirements. This paper defines the requirements for a UARS, explains how these requirements evolved, and demonstrates how advanced technologies can be exploited to deisgn a new unmanned air vehicle to meet the UARS requirements. Author

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ASTRONAUTICS (GENERAL)

A90-10291#
THE EUROPEAN LONG-TERM SPACE PLAN - A BASIS FOR AUTONOMY AND COOPERATION
REIMAR LUEST (ESA, Paris, France) ESA Bulletin (ISSN 0376-4265), no. 59, Aug. 1989, p. 11-16.
Copyright

The ESA resolution on the European Long-Term Space Plan is discussed. The boundary conditions and cornerstones of ESA programs are outlined. The goals and contents of the Long-Term Plan are examined, including the science, earth observation, telecommunications, and microgravity research programs. The plan includes the development of the Ariane-5 launcher, the Columbus program, the Hermes vehicle, and an orbital communications system. Plans for improvements to the ground infrastructure are given, including expansion of the European Space Operation Center, a control center for manned space laboratories, a Hermes Control center, an Astronaut Training Center, and a Control Center for the Data-Relay Satellite. R.B.

A90-13291#
THE GERMAN SPACELAB MISSION D-2 - AN INTERNATIONAL MISSION AND ANOTHER STEP TOWARDS COLUMBUS
HAUKE DODECK (DLR, Cologne, Federal Republic of Germany) and GUENTHER BRANDT (MBB-ERNO Raumfahrttechnik GmbH, Bremen, Federal Republic of Germany) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 13 p. refs
(IAF PAPER 89-072) Copyright

The Spacelab mission D-2, which is under German management, is discussed. The mission goals, which were reoriented following the Shuttle accident, are outlined. The mission parameters and payload composition are also outlined, including both the microgravity research and observational experiments. The international participation and industrialization aspects of the D-2 mission are briefly discussed, as well as the mission support to users in the field of microgravity research. Four new technology examples applied in the D-2 payload instrumentation and infrastructure design are discussed: (1) the measurement of micro-g environment, (2) miniaturized CCD image sensors, (3) 3-D image sensors in hybrid technology, and (4) the application of high density programmable gate arrays. Finally, the D-2 integration and data transfer concepts are examined. S.A.V.

A90-13309*# National Aeronautics and Space Administration, Washington, DC.
SPACE STATION FREEDOM - ITS ROLE AS AN INTERNATIONAL RESEARCH LABORATORY AND OBSERVATORY
CAROLYN GRINER (NASA, Office of Space Station, Washington, DC) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 5 p.
(IAF PAPER 89-099) Copyright

The international partnership agreed to just a year ago among the United States, Canada, Japan and nations participating in the European Space Agency bring us one giant leap closer to unprecedented opportunities in space science and observation. While the driving force of Space Station Freedom has been and continues to be an expansion of human presence in space, the goals of the program go far beyond support of exploration. Integral to the international program is research, conducted on four spacecraft, centering on laboratory and observatory experiments. Research onboard the station's manned base, two polar orbiting observation platforms and the Columbus Free Flying Laboratory will offer research opportunities never available before in life sciences, materials sciences, earth observation, astrophysics and planetary sciences for a wide variety of users over a period of three decades. As such, Space Station Freedom, the world's largest and most useful facility in space, is expected to stimulate advanced technologies, promote the commercial use of space, and increase international cooperation in the peaceful utilization of outer space. Author

A90-13320#
OPTIMISING OF THE SCIENTIFIC-TECHNICAL COMPLEX ON BOARD OF THE ORBITAL STATION 'MIR' AND SPECIFIC PECULIARITIES OF WORK DURING THE SECOND BULGARIAN-SOVIET SPACEFLIGHT
ALEKSAND'R ALEKSANDROV IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 3 p.
(IAF PAPER 89-114)

The scientific equipment and experiments on the Mir orbital station are discussed, focusing on the research conducted during the second Bulgarian-Soviet spaceflight in June, 1988. The methodology used to optimize the efficiency of the scientific and technical systems on the station is outlined. The equipment used for remote sensing, psychophysiological, space physics, astrophyscial, and photographic studies is considered. R.B.

A90-13342#
INTERNATIONAL COOPERATION IN EARTH OBSERVATIONS FROM SPACE
LISA ROBOCK SHAFFER (Science Applications International Corp., Washington, DC) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 8 p.
(IAF PAPER 89-155) Copyright

Earth observation from space requires international cooperation in many areas in order to effectively contribute to the understanding of the earth system. Groups have been established to foster such cooperation in areas including payload planning, data management, calibration and validation, and mission operations. This paper provides a framework for understanding the motivations for international cooperation. It then reviews the existing groups, their objectives and achievements, and identifies areas for future work in international cooperation. Author

A90-13350*# American Inst. of Aeronautics and Astronautics, Washington, DC.
THE NEXT 40 YEARS IN SPACE STANDARDS
H. J. SHEETZ (AIAA, Washington, DC), CHUN CAO (China Astronautics Standards Institute, Beijing, People's Republic of China), and M. S. REID (JPL, Pasadena, CA) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 11 p. refs
(IAF PAPER 89-169) Copyright

Methods used in producing, introducing, and using standards for civilian space research are examined, with special consideration given to the recommendations of the Consultative Committee for Space Data Systems (CCSDS) as an example of a set of standards best coordinated through the International Standard Organization (ISO). The paper uses an example of earth-observation data as a CCSDS application for an international coordination effort within the ISO and describes progress in achieving this objective. Lists of CCDSD member agencies and CCSDS observer agencies are included. I.S.

A90-13507#
NAVSTAR GPS AND GLONASS - GLOBAL SATELLITE NAVIGATION SYSTEMS
P. DALY (Leeds, University, England) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 11 p. refs
(IAF PAPER 89-396) Copyright

Both the Navstar GPS and Glonass satellite navigation systems developed respectively by the United States and the Soviet Union are now planned to become operational by 1995. This paper discusses the widely-differing launch histories of both systems, developments in planned use of orbits, and the deliberate degradation of accuracy by the use of selective availability. Also, consideration is given to progress in plans to provide a joint Navstar GPS/Glonass civil satellite navigation system possibly integrated with other satellite ranging systems and the current status of both systems. Author

A90-13712#
MAJOR SCIENCE MISSIONS
REIMAR LUEST (ESA, Paris, France) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 5 p.
(IAF PAPER 89-750)

Prospects for major science missions in the International Space Year context and beyond are discussed. Special attention is given to the 'Mission to Planet Earth', a continuous study of the earth from space using data obtained by the ERS, SPOT, Radarsat, and Landsat satellites by the earth scientists, particularly by climatologists and oceanographers. The Mission to Planet Earth should increase the public awareness of the contribution that space observations can make to the formidable task of understanding the earth system, and should be a first step in making the earth sciences community as strong and well organized as the space scientists are today. I.S.

A90-13733#
THE NEXT 40 YEARS IN SPACE
THOMAS O. PAINE IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989, Paper. 19 p. refs
Copyright

Plans for the next forty years of U.S. space activities are reviewed. The history of space achievements since 1957 is outlined. Plans for robotic exploration of each planet in the solar system, asteroids, comets, and the interstellar space beyond the heliopause are discussed. Consideration is given NASA strategy for Mars exploration using orbiting spaceports and a lunar base. An extensive bibliography on the history of astronautical technology and missions is included. R.B.

A90-22277
PLANS FOR THE UK GROUND SEGMENT IN A EUROPEAN CONTEXT
D. W. S. LODGE (British National Space Centre, London, England) IN: Spacecraft ground operations and data handling; Proceedings of the Conference, London, England, Feb. 23, 1988. London, Royal Aeronautical Society, 1988, p. 1.1-1.10. refs
Copyright

The managerial tasks facing UK planners with respect to UK participation in the ground segment activities of Columbus and ERS-1, as well as in the accommodation of Canadian participation in Radarsat and Anglo-Norwegian common interest in a Polar Platform spacecraft ground segment, are presently discussed in the context of ministerial-level decisions being made by ESA

member states. Attention is given to the status of existing ground facilities in the UK, namely Lasham, Oakhanger, and the Science and Engineering Research Council's Rutherford Appleton Laboratory. O.C.

A90-24763
THE FRENCH SPACE PROGRAM
LOUIS LAIDET (CNES, Paris, France) IN: Space: National programs and international cooperation. Boulder, CO, Westview Press, 1989, p. 63-78.
Copyright

An overview of the French space program is given. The history of program is reviewed. Several specific programs are described, including the Ariane launch program, the Hermes transportation system, the Symphonie communications satellites, the Telecom digital telecommunications program, the TDF direct broadcasting satellite, the SPOT remote sensing program, the ARGOS satellite data collection system, and the Sarsat-Cospas location program. Scientific programs, research and technology programs, and cooperative space science programs between the U.S. and France are discussed. Also, consideration is given to the major participants and research facilities involved in the French space program. R.B.

A90-26988*# National Aeronautics and Space Administration, Washington, DC.
TECHNOLOGIES FOR GLOBAL CHANGE EARTH OBSERVATIONS
GORDON I. JOHNSTON and WAYNE R. HUDSON (NASA, Office of Aeronautics and Space Technology, Washington, DC) AIAA, Aerospace Sciences Meeting, 28th, Reno, NV, Jan. 8-11, 1990. 12 p. refs
(AIAA PAPER 90-0767)

Advances in the areas of space-based observations, data/information analysis, and spacecraft/operations for the studying of global changes are discussed. Research involving systems analysis, observation technologies, information technologies, and spacecraft technologies is examined. Consideration is given to cryogenic coolers, IR arrays, laser and submillimeter sensing, large array CCD, information visualization, design knowledge capture, optical communications, multiinstrument pointing, propulsion, space environmental effects, and platform thermal systems. I.F.

A90-33634
THE USO TEAM AT WORK AT DLR
F. UNZ (DLR, Cologne, Federal Republic of Germany) (ESA, BMFT, Ministero per il Coordinamento della Ricerca Scientifica e Tecnologica, et al., Columbus Symposium on Space Station Utilization, 5th, Capri, Italy, July 3-7, 1989) Space Technology - Industrial and Commercial Applications (ISSN 0892-9270), vol. 10, no. 1-2, 1990, p. 57-59.
Copyright

The task and first working results of the User Support Organization (USO) Definition Team in the present working period are reviewed. The four major parts of the task, ground infrastructure concept, user center specifications, management proposal for USO, and final documents, are described. Activities and responsibilities of the team in the subsequent phases of the Columbus program are defined. This phase is expected to cover all disciplines and produce results in the fields of microgravity, space sciences, earth observation, and user relevant technology. N.B.

A90-36124#
THE INTERNATIONAL SPACE PROJECT 'PRIRODA' [MEZHDUNARODEN TSELEVI KOSMICHESKI PROEKT 'PRIRODA']
DIMIT'R MISHEV and TODOR NAZ'RSKI B'lgarska Akademiia na Naukite, Spisanie (ISSN 0007-3989), vol. 36, no. 1, 1990, p. 35-40. In Bulgarian.

The main objectives of the Priroda project are outlined. The Priroda project, which is part of the Intercosmos program, is a remote sensing project intended to study the characteristics of the earth's land masses, oceans, and atmosphere. Consideration is given to the instrumentation for the Priroda project and the installation of the Priroda instruments on a special module of the Mir space station. Specific emphasis is placed on the role of Bulgaria in the Priroda project, focusing on a dual-polarization radiometric system constructed in Bulgaria. R.B.

A90-42310#
ERS-1 - A CONTRIBUTION TO GLOBAL ENVIRONMENTAL MONITORING IN THE 1990S
S. BRUZZI (ESA, Paris, France) and M. WOODING (ESA, Farnborough, England) ESA Bulletin (ISSN 0376-4265), no. 62, May 1990, p. 10-21.
Copyright

The proposed use of the European Remote-Sensing Satellite (ERS-1) for studying the environment is discussed. ERS-1 uses microwave/radar techniques to obtain data on the sea state, sea-surface winds, ocean circulation, and sea/ice levels and to provide all-weather imaging of oceans, ice, and land. The spacecraft platform is three-axis stabilized, with yaw steering, nadir pointing, and roll/tilt capabilities. The composition of the satellite's payload and their functions are described. The planned orbit for the satellite is sun synchronous with a mean altitude of 785 K and an inclination of 98.5 deg. Consideration is given to the ERS-1 ground segment which consists of facilities for satellite control and operations and for the reception, archiving, and processing of data. ERS-1 is applicable for weather forecasting, sea-state forecasting, ice mapping, pollution monitoring, ship detection, and land applications. I.F.

A90-43363
HOW ISY CAN BENEFIT DEVELOPING COUNTRIES
U. R. RAO (ISRO, Bangalore, India) Space Policy (ISSN 0265-9646), vol. 6, May 1990, p. 91-96.
Copyright

The effects of the International Space Year (ISY), planned for 1992, on developing countries are examined. The need to improve satellite communications in developing countries is discussed. Consideration is given to the benefits ISY can provide in the areas of resource management and weather, climate, and environment monitoring. The proposed Protection of the Environment for Assuring a Cleaner Earth mission is also discussed. I.F.

A90-44253
GENERAL PRINCIPLES OF RELEVANT SATELLITE SYSTEMS
J. ASKNE (Chalmers Tekniska Hogskola, Goteborg, Sweden) IN: Microwave remote sensing for oceanographic and marine weather-forecast models; Proceedings of the NATO Advanced Study Institute, Dundee, Scotland, Aug. 14-Sept. 3, 1988. Dordrecht, Netherlands, Kluwer Academic Publishers, 1990, p. 23-44. refs
Copyright

The physical principles underlying the operation of satellite microwave instruments for remote sensing of the oceans are reviewed, and specific sensors are characterized. Topics addressed include platform-imposed limits on sensor weight and power consumption, the atmospheric propagation of microwaves in different frequency bands, the basic sensor types (radiometers, radars, SARs, altimeters, and scatterometers), spatial sampling and resolution, the theory of orbital motion and orbit accuracy requirements, and data and information systems. The specific satellites described include Seasat, Nimbus-7, Cosmos 1500, Geosat, SSM/I, MOS-1, N-ROSS, Topex-Poseidon, JERS-1, and Radarsat; particular attention is given to the ESA ERS-1 satellite (orbit parameters, active microwave instrumentation, altimeter, along-track scanning radiometer, ground segment, and data dissemination) and the instruments being developed for the ESA polar platform (as part of the NASA International Space Station). T.K.

N90-16784# European Space Agency, Paris (France).
THE EUROPEAN LONG-TERM SPACE PLAN: A BASIS FOR AUTONOMY AND COOPERATION

REIMAR LUEST *In its* Progress in Space Transportation p 9-13 Aug. 1989 Previously announced in IAA as A90-10291
Copyright Avail: NTIS HC A22/MF A03

The long term space mission plans of ESA are outlined. The present status of the long term plan execution is presented. The Solar-Terrestrial Science program, the Hipparcos satellite, the Earth Remote Sensing satellite, the Ariane 5, Columbus, and Hermes programs are all looked at, and the progress made in each described. ESA

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ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

A90-39771
ON THE USE OF SATELLITES IN MOLNIYA ORBITS FOR METEOROLOGICAL OBSERVATION OF MIDDLE AND HIGH LATITUDES
STANLEY Q. KIDDER and THOMAS H. VONDER HAAR (Cooperative Institute for Research in the Atmosphere, Fort Collins, CO) Journal of Atmospheric and Oceanic Technology (ISSN 0739-0572), vol. 7, June 1990, p. 517-522.
(Contract DAAL03-86-K-9175; NOAA-NA-85RAH05045)
Copyright

Time and space sampling is an increasingly critical aspect of earth observation satellites. The highly eccentric orbit used by Soviet Molniya satellites functions much like a high-latitude geostationary orbit. Meteorological instruments placed on a satellite in a Molniya orbit would improve the temporal frequency of observation of high-latitude phenomena such as polar lows. Consideration of this new sampling strategy is suggested for future systems such as the 'Earth Probe' satellites in the Mission to Planet Earth program as well as for operational meteorological satellite programs. Author

A90-52966#
ANALYSIS OF THE ORBIT OF THE JOINT SOVIET/EUROPEAN X-RAY ASTRONOMY MISSION ÅSPECTRUM-XÅ
R. HOLDAWAY and G. H. SPALDING (Rutherford Appleton Laboratory, Didcot, England) IN: AIAA/AAS Astrodynamics Conference, Portland, OR, Aug. 20-22, 1990, Technical Papers. Part 1. Washington, DC, American Institute of Aeronautics and Astronautics, 1990, p. 91-98.
(AIAA PAPER 90-2874) Copyright

A combined USSR and East/West European program for X-ray astronomic observations is presented. The Spectrum-X mission, scheduled for launch in 1993 on a Proton ELV will carry two prime instruments on board: a high-resolution medium energy X-ray telescope and a medium-resolution medium-energy X-ray telescope. Other instruments on board the satellite will permit the study of EUV, X-ray, and gamma-ray sources from the optical waveband up to energies of 10 MeV. R.E.P.

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SPACE COMM., SPACECRAFT COMM., COMMAND & TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout.

A90-13582#
PROSPECTIVES OF DEVELOPMENT OF SATELLITE MOBILE COMMUNICATIONS NAVIGATION AND SURVEILLANCE (CNS) SYSTEMS - THE NAVIGATION ISSUE
C. ROSETTI (ESA, Paris, France) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 18 p.
(IAF PAPER 89-510) Copyright

Possible solutions to problems currently associated with the civilian use of the GPS and Glonass navigation satellite systems are formulated. The most important problem involves integrity monitoring and health warning; it is suggested that time differences between satellites be measured and integrated into the GPS and Glonass signal structure. An additional goal of the present study is the augmentation of the GPS and Glonass satellite navigation systems with an initially GEO complement able to furnish both integrity information and supplementary navigation signals at marginal cost. O.C.

A90-28090* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GROUND DATA SYSTEM ARCHITECTURE FOR PRECIPITATION DETERMINATION FROM SPACE-BASED RADAR
JEFFREY E. HILLAND (JPL, Pasadena, CA) IN: Oceans '89; Proceedings of the International Conference, Seattle, WA, Sept. 18-21, 1989. New York, Institute of Electrical and Electronics Engineers, 1989, p. 987-991. refs
Copyright

The Tropical Rain Mapping Radar (Tramar) is proposed as an attached payload as part of the Space Station Earth Observing System Program. Tramar would measure rainfall rates, rain velocity, and rain cell areal extent in the latitude band from 30 deg S to 30 deg N for use in studies of large-scale atmospheric circulation, variations of latent heating, tropical hydrologic processes, and mesoscale precipitation systems. The Tramar science requirements, radar design, and ground data system architecture are examined, including the three-dimensional scan geometry, the radar system performance parameters, the production of earth-gridded maps, and the telemetry, sensor, radiometric, and geophysical data that would be obtained by Tramar. R.B.

A90-28898*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ADVANCED ORBITING SYSTEMS - A STANDARD ARCHITECTURE FOR SPACE DATA COMMUNICATIONS
ADRIAN J. HOOKE (JPL, Pasadena, CA) IN: ITC/USA/'89; Proceedings of the International Telemetering Conference, San Diego, CA, Oct. 30-Nov. 2, 1989. Research Triangle Park, NC, Instrument Society of America, 1989, p. 825-833.

The standard data handling service architecture developed by the Consultative Committee for Space Data Systems is discussed. Special attention is given to the communications protocols that are recommended for the networked transfer of space mission data, with emphasis on the unique requirements of transmitting many different data types through the weak-signal noisy space channels at high rates (up to many hundreds of megabits per second). A user service model of a typical space mission data flow configuration, known as the 'pipe diagram', is described in detail. I.S.

A90-34145* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EARTH OBSERVING SYSTEM (EOS) SAR GROUND DATA SYSTEM
JOHN C. CURLANDER (JPL, Pasadena, CA) IN: Millimeter wave and synthetic aperture radar; Proceedings of the Meeting, Orlando, FL, Mar. 27, 28, 1989. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1989, p. 210-220. refs
Copyright
NASA, in association with ESA and NASDA, will launch the Space Station Freedom in 1993. As a complement to the Space Station, several unmanned Polar-Orbit Platforms (POPs) will be developed, built and launched with suites of instruments devoted to remote-sensing for earth surface and atmosphere observations or to planetary and deep-space studies. Attention is presently given to the POPs-associated Earth Observing System SAR Ground Data System, which encompasses a SAR processor, a postprocessing subsystem, a geophysical processor, and a data management and control subsystem. O.C.

18

SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

A90-50608#
MONITORING THE OCEAN WITH NAVY RADAR ALTIMETER LIGHTSATS
CHARLES C. KILGUS, ERIC J. HOFFMAN, and WILLIAM E. FRAIN (Johns Hopkins University, Laurel, MD) IN: Annual AIAA/Utah State University Conference on Small Satellites, 3rd, Logan, UT, Sept. 26-28, 1989, Proceedings. Logan, UT, Utah State University, 1989, 12 p.
(Contract N00039-89-C-5301)
The satellite radar altimetry requirements to support U.S. Navy tactical oceanographic modeling, are described. It is stipulated that a system of three radar altimeter lightsats would provide optimum temporal and spatial sampling of the sea surface height signatures of ocean features at midlatitudes and above, and that merging this data with satellite IR images would provide an all-weather global ocean monitoring system supporting the Tactical Oceanography mission. Mapping of surface signatures using remote sensing data is described, and optimum temporal and spatial sampling of the ocean is mapped out. The evolution of lightsat remote ocean sensing, lightsat design principles, radar altimeter design description, and the Geoscout spacecraft bus and power system are detailed. The mechanical configuration and the data storage and handling system are characterized. L.K.S.

N90-15840*# Little (Arthur D.), Inc., Cambridge, MA.
THE SOLAR POWER SATELLITE (SPS): PROGRESS SO FAR
PETER E. GLASER *In* NASA, Langley Research Center, Report of NASA Lunar Energy Enterprise Case Study Task Force p 68-83 Jul. 1989
Avail: NTIS HC A09/MF A02 CSCL 22/2
Major developments in key Solar Power Satellite (SPS)-related technologies are outlined and the significance of these developments are evaluated considering the SPS, both as an alternate energy option for use on Earth and as a potential stimulus for space infrastructure developments and expansion of the use of extraterrestrial resources. B.G.

N90-24292*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEVELOPMENT OF COST-EFFECTIVE STANDARDS FOR EARTH OBSERVATION SPACECRAFT
ANDREA M. FEDEROFF (Science Applications International Corp., Los Altos, CA.) and NEVILLE I. MARZWELL *In* ESA, Second European In-Orbit Operations Technology Symposium p 65-71 Dec. 1989
Copyright Avail: NTIS HC A19/MF A03; ESA Publications Div., ESTEC, Noordwijk, Netherlands, 80 Dutch guilders CSCL 22/2
A program to accomplish a technical interdisciplinary approach to international standards development is described. Working groups include: remote sensing spacecraft, sensing system, operations, and communication and data systems. Additionally, the software reliability and international liaison working groups are discussed. ESA

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SPACECRAFT INSTRUMENTATION

A90-10151
SPACE OPTICAL INSTRUMENTATION FOR EARTH OBSERVATION - THE POLAR PLATFORM ERA
ARMAND PERALDI (Matra Espace, Toulouse, France) IN: Infrared technology XIV; Proceedings of the Meeting, San Diego, CA, Aug. 15-17, 1988. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1988, p. 135-142.
Copyright
Consideration is given to two instruments for earth observation from large polar platforms: a Thermal IR Imager (TIRI) and a High Resolution Imaging Spectrometer (HRIS). TIRI is an optical push-broom imager designed for operation in the 8-12 micron band, split into two spectral bands. Because each line of an image is electronically scanned by linear arrays of detectors, TIRI does not require a mechanical scanning device. HRIS is designed to provide very high resolution images from 260 spectral channels. Any set of 30 individual channels may be transmitted to the ground. These two instruments are described and illustrated and the possible applications of the instruments on a polar platform are discussed. R.B.

A90-11285* Lockheed Missiles and Space Co., Palo Alto, CA.
CRYOGENIC LIMB ARRAY ETALON SPECTROMETER (CLAES) - INSTRUMENT OVERVIEW
LARRY BURRIESCI, LARRY NAES, LARRY SPRINGER, and BRUCE STEAKLEY (Lockheed Research Laboratories, Palo Alto, CA) IN: Cryogenic optical systems and instruments III; Proceedings of the Meeting, San Diego, CA, Aug. 17-19, 1988. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1989, p. 335-341.
(Contract NAS5-27752)
Copyright
The design and capabilities of CLAES are described. The CLAES is an instrument on NASA's Upper Atmosphere Research Satellite (UARS) and measures the global concentrations of stratospheric species and temperature over the altitude range 10-60 km. Consideration is given to the motorized limb acquisition and adjustment mirror, solid cryogen cooler, optical system, electronics subsystems, cryostat, and IR calibration source. Diagrams of the CLAES and UARS are provided. I.F.

A90-30109
ISAMS AND MLS FOR NASA'S UPPER ATMOSPHERE RESEARCH SATELLITE
D. LLEWELLYN-JONES and P. H. G. DICKINSON (Rutherford Appleton Laboratory, Didcot, England) British Interplanetary Society, Journal (ISSN 0007-084X), vol. 43, April 1990, p. 143-146.
Copyright
The primary goal of NASA's Upper Atmosphere Research Satellite (UARS), planned to be launched in 1991, is to compile

data about the structure and behavior of the stratospheric ozone layer, and especially about the threat of the chlorine-based pollutants to its stablility. Two of the payload instruments, manufactured in the UK, are described: the Improved Stratospheric and Mesospheric Sounder (ISAMS), a radiometer designed to measure thermal emission from selected atmospheric constituents at the earth's limb, then making it possible to obtain nearly global coverage of the vertical distribution of temperature and composition from 80 deg S to 80 deg N latitude; and the Microwave Limb Sounder (MLS), a limb sounding radiometer, measuring atmospheric thermal emission from selected molecular spectral lines at mm wavelength, in the frequency regions of 63, 183, and 205 GHz. N.B.

A90-39436* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
THE STRATOSPHERIC AEROSOL AND GAS EXPERIMENT III INSTRUMENT PROPOSED FOR EOS - A CONCEPTUAL DESIGN
L. E. MAULDIN, M. P. MCCORMICK, J. M. ZAWODNY, L. R. MCMASTER, W. P. CHU, J. C. GUSTAFSON, and G. L. MADDREA (NASA, Langley Research Center, Hampton, VA) IN: Advanced optical instrumentation for remote sensing of the earth's surface from space; Proceedings of the Meeting, Paris, France, Apr. 27, 28, 1989. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1989, p. 30-36. refs
Copyright

This paper describes the Stratospheric Aerosol and Gas Experiment III (SAGE III) instrument proposed for the Earth Observing System (EOS), which is designed to monitor the vertical distribution of stratospheric aerosols, ozone, water vapor, nitrogen dioxide, and temperature by measuring the extinction and scattering of solar radiation in the 03 to 1.6 micron range through the atmosphere. The SAGE III employs proven concepts which have evolved from the SAM II, SAGE, and SAGE II programs. The launch is scheduled for the summer of 1996. The SAGE II block diagram is included. I.S.

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COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications.

A90-24257
AUXILIARY SIGNAL DESIGN IN FAULT DETECTION AND DIAGNOSIS
XUE JUN ZHANG (Shell Research, Koninklijke/Shell Laboratorium, Amsterdam, Netherlands) Research supported by the British Council and State Education Commission of China. Berlin and New York, Springer-Verlag (Lecture Notes in Control and Information Sciences. Volume 134), 1989, 225 p. refs
Copyright

Fault-detection and diagnosis schemes for systems represented by linear MIMO stochastic models are developed analytically, with a focus on on the design and application of auxiliary signals. The basic principles of optimal-input design are reviewed, and consideration is given to the sequential probability ratio test (SPRT), auxiliary signals for improving SPRT fault detection, and the extension of the SPRT to multiple-hypothesis testing. Two chapters are devoted to the application of the SPRT to a model chemical plant (producing anhydrous caustic soda), including model derivation, model identification, detection of type I and type II faults, and the fault-diagnosis decision-making mechanism. Numerical results are presented in graphs and briefly characterized. T.K.

N90-19470# Technische Univ., Berlin (Germany, F.R.). Fachbereichsrat.
GENERAL MULTIDIMENSIONAL SCANNING RATIO TRANSFORMATION AND ITS UTILIZATION FOR NORM TRANSFORMATION OF TELEVISION SIGNALS Ph.D. Thesis [ALLGEMEINE MEHRDIMENSIONALE ABTASTRATENUMSETZUNG UND IHRE ANWENDUNG ZUR NORMUMSETZUNG VON FERNSEHSIGNALEN]
THOMAS REUTER 1989 130 p In GERMAN
(ETN-90-96058) Avail: NTIS HC A07/MF A01

The calculation of the spectrum of the analyzed signal is carried out for some periodic scanning samples, also nonregular. The ideal scanning was in the first place described in the frequency area. The frequency response of conventional norm-change processes was calculated as a time and space varying system and compared with the ideal frequency response. By this method, a systematic classification of apparent errors was possible, and opportunities of improving the transformation were clearly envisaged. Some remarked errors result from the insufficient approximation of the ideal frequency response: for example, the ideal band limitation of the input signal is an erroneous assumption. Therefore the interpolation filter must be fitted to the spectrum of the signal. In the case of a moving object, a nonlinear study of the movement vectors is essential to use the nonhomogeneous vector field for an adaptive interpolation. ESA

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

N90-27161*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
APPLICATIONS OF ISES FOR INSTRUMENT SCIENCE
WILLIAM B. GRANT *In its* Earth Sciences Requirements for the Information Sciences Experiment System p 213-215 Jul. 1990
Avail: NTIS HC A10/MF A02 CSCL 14/2

It is often the case that some instruments being used for geophysical measurements cannot measure some parameters that are important for processing the data obtained using the instrument. However, the parameters of interest may be measured by other instruments and these data made available to the operators of the first instrument. Processing the data immediately after it is acquired is useful in directing the operation of the same or different instrument or in providing a quick look data set to users on the ground. The four applications which are considered are: the decision to acquire data due to some important occurrence detected by Eos instruments; the decision not to acquire data at a scheduled time and/or location; the decision to acquire additional data to improve data quality; and combining data from several sources to enhance data quality. General examples are presented, which may or may not apply directly to Eos instruments on the various platforms. Author

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QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

A90-43726
INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, 35TH, ANAHEIM, CA, MAY 1-5, 1989, PROCEEDINGS

Mount Prospect, IL, Institute of Environmental Sciences, 1989, 460 p. For individual items see A90-43727 to A90-43746.
Copyright

The present conference discusses the combination of thermal and high level acoustics, the correlation between vibration and computer operator response aboard a UH-1H helicopter, microcalorimetric methods for corrosion rate measurement, a building-block approach for life cycle environmental profile development, fatigue life assessment for a leaded electronic component, determination of product fragility for packaging optimization, and a decision-theoretic concept of thermal reliability growth acceleration. Also discussed are a practical method for the tailoring of environmental stress screens, product verification during stress screening, aircraft gunfire response predictions, simple fixture concepts for multiaxis vibration testing, a shock and vibration data base for military equipment, terpenes as environmentally safe halogenated solvent replacements, air toxic risk assessment, a new method of airflow visualization, particle generation during fiber abrasion, and particle transport in computer disk drives. O.C.

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GEOSCIENCES (GENERAL)

A90-13711#
MISSION TO PLANET EARTH
JOHN L. MCLUCAS (NASA, Advisory Council, Washington, DC) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 6 p.
(IAF PAPER 89-749) Copyright

The Mission to Planet Earth is a research program designed to obtain information on the earth and the global changes taking place in the environment, including the 'natural'changes due to internal processes within the earth environment, the effects of energy and particles arriving from the outer space, and the effects of man and other living organisms inhabiting the earth. This paper emphasizes the need for multinational commitment to the collection of data on various global phenomena and for the 'end-to-end' management of the data handling process, which must combine data from many sources and do it properly to reveal useful information. The role of NASA and other space agencies in organizing these efforts is discussed. Special attention is given to the role of SAFISY (the Space Agency Forum for the International Space Year) formed with participation of 24 nations to coordinate the activities of various space agencies on the Mission to Planet Earth project. I.S.

A90-18639
EARTH - A PROBLEM IN PLANETARY MANAGEMENT
MARTIN HEATH British Interplanetary Society, Journal (ISSN 0007-084X), vol. 42, Dec. 1989, p. 559-566. refs
Copyright

Environmental management of the earth is examined, noting the implications of earth management for terraforming of other planets. Consideration is given to environmental engineering, the Gaia (Lovelock, 1979) theory of natural climatic regulation, the threat of natural climatic change, and anthopogenic modification of the climate. The need for studying the processes that maintain the earth climate, and possible methods for controlling the earth environment. R.B.

A90-21441* Lamont-Doherty Geological Observatory, Palisades, NY.
CLIMATE-INDUCED CHANGES IN FOREST DISTURBANCE AND VEGETATION
JONATHAN T. OVERPECK (Lamont-Doherty Geological Observatory, Palisades, NY), DAVID RIND (NASA, Goddard Institute for Space Studies, New York), and RICHARD GOLDBERG (Columbia University, New York) Nature (ISSN 0028-0836), vol. 343, Jan. 4, 1990, p. 51-53. Research supported by EPA and NSF. refs
Copyright

New and published climate-model results are discussed which indicate that global warming favors increased rates of forest disturbance as a result of weather more likely to cause forest fires, convective wind storms, coastal flooding, and hurricanes. New sensitivity tests carried out with a vegetation model indicate that climate-induced increases in disturbance could, in turn, significantly alter the total biomass and compositional response of forests to future warming. An increase in disturbance frequency is also likely to increase the rate at which natural vegetation responses to future climate change. The results reinforce the hypothesis that forests could be significantly altered by the first part of the next century. The modeling also confirms the potential utility of selected time series of fossil pollen data for investigating the poorly understood natural patterns of century-scale climate variability. C.D.

A90-26580* Massachusetts Inst. of Tech., Cambridge.
SOME COOLNESS CONCERNING GLOBAL WARMING
RICHARD S. LINDZEN (MIT, Cambridge, MA) American Meteorological Society, Bulletin (ISSN 0003-0007), vol. 71, March 1990, p. 288-299. refs
(Contract NSF ATM-85-20354; NAGW-525)
Copyright

The greenhouse effect hypothesis is discussed. The effects of increasing CO2 levels in the atmosphere on global temperature changes are analyzed. The problems with models currently used to predict climatic changes are examined. I.F.

A90-29801* Colorado Univ., Boulder.
OBSERVATIONAL CONSTRAINTS ON THE GLOBAL ATMOSPHERIC CO2 BUDGET
PIETER P. TANS (Cooperative Institute for Research in Environmental Sciences, Boulder, CO), INEZ Y. FUNG (NASA, Goddard Space Flight Center, Greenbelt, MD), and TARO TAKAHASHI (Lamont-Doherty Geological Observatory, Palisades, NY) Science (ISSN 0036-8075), vol. 247, March 23, 1990, p. 1431-1438. Research supported by NOAA, NSF, Martin Marietta Corp., and Exxon Research and Engineering Co. refs
(Contract DE-AC05-84OR-21400)
Copyright

Observed atmospheric concentrations of CO2 and data on the partial pressures of CO2 in surface ocean waters are combined to identify globally significant sources and sinks of CO2. The atmospheric data are compared with boundary layer concentrations calculated with the transport fields generated by a general circulation model (GCM) for specified source-sink distributions. In the model the observed north-south atmospheric concentration gradient can be maintained only if sinks for CO2 are greater in the Northern than in the Southern Hemisphere. The observed differences between the partial pressure of CO2 in the surface waters of the Northern Hemisphere and the atmosphere are too small for the oceans to be the major sink of fossil fuel CO2. Therefore, a large amount of the CO2 is apparently absorbed on the continents by terrestrial ecosystems. Author

A90-31779#
OVERVIEW AND STATUS OF U.S. EARTH-OBSERVING OPERATIONAL SATELLITE PLANS THROUGH THE 1990'S
JOHN W. SHERMAN, III (NOAA, National Environmental Satellite, Data, and Information Service, Washington, DC) IN: International Symposium on Remote Sensing of Environment, 22nd, Abidjan, Cote d'Ivoire, Oct. 20-26, 1988, Proceedings. Volume 1. Ann Arbor, MI, Environmental Research Institute of Michigan, 1989, p. 47-60. refs

This paper discusses the U.S. operational environmental satellite program activity as currently planned for the 1990s with particular attention given the 1989 to 1996 period. This activity is one component of the requirement for U.S. Federal agencies to prepare a biennial report describing the status of earth satellite

remote sensing. The emphasis here is on the products obtained from these operational satellites and not on the instruments from which data is derived. Author

A90-38002
EUROPEAN SPACE AGENCY (ESA) STRATEGY FOR EARTH OBSERVATION INTO THE 21ST CENTURY
P. GOLDSMITH and G. DUCHOSSOIS (ESA, Paris, France) IN: Optical space communication; Proceedings of the Meeting, Paris, France, Apr. 24-26, 1989. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1989, p. 2-8.
Copyright

A major consideration in ESA's strategy for earth observation developments into the early 21st century is the encouragement of expansion in the pool of commercial users, in the hope that they will shoulder a growing portion of the financial burden in the long term. One of the roles of Earthnet will be to spearhead the promotion of earth-observation products for such users. The benefits associated with such a development program not merely industrial and scientific, but also political, in ensuring that European politicians have access to the best possible advice when debating alternative earth resources use-related policies. O.C.

A90-42276
THE ENVIRONMENT - A CHALLENGE TO AIR AND SPACE FLIGHT [UMWELT - EINE HERAUSFORDERUNG AN LUFT- UND RAUMFAHRT]
W. KROELL and R. BACKHAUS (DLR, Cologne, Federal Republic of Germany) Zeitschrift fuer Flugwissenschaften und Weltraumforschung (ISSN 0342-068X), vol. 14, June 1990, p. 139-144. In German. refs
Copyright

The significance of remote sensing by aircraft and spacecraft for the study of the environment is addressed. The environmental applications of the ERS-1, Atmos satellite, and polar platforms are considered, and related plans being made for the International Space Year and by the DLR are examined. The compatibility of various aircraft and spacecraft systems with the environment is discussed. C.D.

A90-44252
ON THE ROLE OF SCIENCE IN PREPARING OPERATIONAL USES OF EARTH OBSERVATIONS FROM SPACE
R. FRASSETTO (CNR, Istituto per lo Studio della Dinamica delle Grandi Masse, Venice, Italy) IN: Microwave remote sensing for oceanographic and marine weather-forecast models; Proceedings of the NATO Advanced Study Institute, Dundee, Scotland, Aug. 14-Sept. 3, 1988. Dordrecht, Netherlands, Kluwer Academic Publishers, 1990, p. 1-22. refs
Copyright

Scientific and organizational issues regarding the incorporation of satellite remote-sensing data into global and regional ocean and climate models are discussed. The factors affecting global climate and sea levels and the principles involved in constructing numerical models are reviewed; the important role of the ocean is explained; the activities of national and international organizations in planning and performing satellite remote sensing campaigns and analyzing and distributing the data products are described; and the need for new instruments such as Doppler lidar profilers, active rain radars in LEO, and differential-absorption passive sounders and lidars for boundary-layer properties is indicated. Particular attention is then given to the ESA earth-observation and data-management strategies, models and observation campaigns for the Mediterranean, and the application of remote-sensing data and model predictions in efforts to safeguard the city of Venice from flooding. Extensive maps and diagrams are provided. T.K.

A90-49651
QUANTITATIVE REMOTE SENSING: AN ECONOMIC TOOL FOR THE NINETIES; PROCEEDINGS OF THE 1989 INTERNATIONAL GEOSCIENCE AND REMOTE SENSING SYMPOSIUM AND CANADIAN SYMPOSIUM ON REMOTE SENSING, 12TH, (IGARSS'89), UNIVERSITY OF BRITISH COLUMBIA, VANCOUVER, CANADA, JULY 10-14, 1989
J. F. R. GOWER, ED. (Institute of Ocean Sciences, Sidney, Canada) Symposia sponsored by IEEE, Canadian Remote Sensing Society, URSI, et al. IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. 28, July 1990, 371 p. For individual items see A90-49652 to A90-49707.
Copyright

The present conference discusses topics in microwave propagation and backscatter, advanced image-processing techniques, SAR instruments and data processing, and image-data measurement. Attention is given to inexpensive high-performance polarimetric data from in situ measurements, radio brightness of diurnally heated freezing soil, texture spectra and texture analyses, cloud and surface textural features in polar regions, computer-aided linear planimetric feature extraction, and the Radarsat system. Also discussed are the scope of impedance boundary conditions in radio propagation, a 95-GHz short-pulse radar, textural filtering for SAR image processing, remote sensing and geographic information systems, the assessment of tropical forest stand characteristics with multipolarization SAR, and the infrastructural requirements of operational use of remote-sensing data. I.E.

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

A90-11754
DETECTING MAN-MADE CHANGES IN IMAGERY
MARK J. CARLOTTO and MICHAEL C. STEIN (Analytic Sciences Corp., Reading, MA) IN: Intelligent robots and computer vision; Proceedings of the Seventh Meeting, Cambridge, MA, Nov. 7-11, 1988. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1989, p. 38-45. refs
Copyright

A technique for detecting man-made objects using a fractal image modeling approach is described. The technique is based on comparing multiscale signatures computed within sliding windows over coincident regions in 'before' and 'after' images. The signatures are computed by successive morphological erosions and dilations of the image intensity surface. Similarity measures that are a function of the surface area, fractal dimension, and fractal dimension estimation error over a range of scales are developed for discriminating between natural and man-made changes. The algorithm is applied to digitized aerial photography and SPOT satellite imagery with very encouraging results. Implementation considerations for massively-parallel architectures are discussed. Author

A90-12760* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EARTH OBSERVATIONS DURING SPACE SHUTTLE FLIGHT STS-27: A HIGH LATITUDE OBSERVATIONS OPPORTUNITY - 2-6 DECEMBER 1988
VICTOR S. WHITEHEAD, MICHAEL R. HELFERT, KAMLESH P. LULLA, CHARLES A. WOOD, DAVID L. AMSBURY, ROBERT GIBSON, GUY GARDNER, MIKE MULLANE, JERRY ROSS, BILL SHEPHERD (NASA, Johnson Space Center, Houston, TX) et al. Geocarto International (ISSN 1010-6049), vol. 4, Sept. 1989, p. 63-76. refs
Copyright

The earth observations from the STS-27 mission on December

2-6, 1988 are reported. The film and generic scene characteristics chosen for the mission are given. Results are given from geological observations of the Ruwenzori Mountains between Uganda and Zaire, four rift valley systems in Africa and Asia, and several volcanoes and impact craters. Environmental observations of Africa, the Middle East, South Asia, North America and the Soviet Union, are presented. Also, meteorological and oceanographic observations are discussed. The uniqueness of the high-inclination winter launch of the STS-27 mission for obtaining observations of specific features is noted. R.B.

A90-21467
CONTRIBUTIONS OF THE DLR TO FOREST DAMAGE RESEARCH [BEITRAEGE DER DLR ZUR WALDSCHADENSFORSCHUNG]
VOLKER AMANN, WERNER KIRCHHOF, GEORG KRITIKOS, GERD LANDAUER, RUPERT MUELLER (DLR, Institut fuer Optoelektronik, Oberpfaffenhofen, Federal Republic of Germany) et al. DLR-Nachrichten (ISSN 0937-0420), Nov. 1989, p. 29-37. In German. refs
Copyright

The use of remote sensing in the study of damage to forests caused by pollution and various human activities are addressed. Methods of acquiring data on such harm are reviewed, emphasizing the aircraft types and instrument types used by DLR. The evaluation of the resulting images and the construction of charts based on them are examined. C.D.

A90-21468
FOREST MAPPING USING SATELLITE IMAGES [WALDKARTIERUNG MIT SATELLITENBILDDATEN]
MANFRED KEIL, MATHIAS SCHARDT, ANGELA SCHUREK, and RUDOLF WINTER (DLR, Oberpfaffenhofen, Federal Republic of Germany) DLR-Nachrichten (ISSN 0937-0420), Nov. 1989, p. 38-42. In German.
Copyright

Remote sensing mapping of German forests to help avert further damage due to pollution and human activities are addressed. The methods used to conduct the mapping are described, and results already achieved in the area of Regensburg are reviewed. The techniques used to classify damaged parts of forest are explained. C.D.

A90-21682* Reading Univ. (England).
COMPARISON OF DATA FROM THE SCANNING MULTIFREQUENCY MICROWAVE RADIOMETER (SMMR) WITH DATA FROM THE ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) FOR TERRESTRIAL ENVIRONMENTAL MONITORING - AN OVERVIEW
J. R. G. TOWNSHEND (Reading, University, England), B. J. CHOUDHURY, C. J. TUCKER (NASA, Goddard Space Flight Center, Greenbelt, MD), L. GIDDINGS (Instituto Nacional de Investigaciones sobre Recursos Bioticos, Veracruz, Mexico), C. O. JUSTICE (Maryland, University, College Park) et al. International Journal of Remote Sensing (ISSN 0143-1161), vol. 10, Oct. 1989, p. 1687-1690. refs
Copyright

Comparison between the microwave polarized difference temperature (MPDT) derived from 37 GHz band data and the normalized difference vegetation index (NDVI) derived from near-infrared and red bands, from several empirical investigations are summarized. These indicate the complementary character of the two measures in environmental monitoring. Overall the NDVI is more sensitive to green leaf activity, whereas the MPDT appears also to be related to other elements of the above-ground biomass. Monitoring of hydrological phenomena is carried out much more effectively by the MPDT. Further work is needed to explain spectral and temporal variation in MPDT both through modelling and field experiments. Author

A90-22292
DEVELOPMENT OF REMOTE SENSING ACTIVITIES IN INDONESIA
JEAN-PHILIPPE GASTELLU-ETCHEGORRY (Services de Consultance en Observation de la Terre, Toulouse, France) ITC Journal (ISSN 0303-2434), no. 2, 1989, p. 130-138. refs
Copyright

The status of remote sensing activities in Indonesia is reviewed, including the organizations that manage remote sensing activities, and the technical limitations, applications, and economic prospects of remote sensing in Indonesia. The use of NOAA, geostationary meteorologic satellite, and Landsat data and plans for obtaining SPOT data are discussed. The problem of obtaining cloud-free images of Indonesia and the atmospheric and agricultural/forest systems of the region are examined. Remote sensing studies in Indonesia are noted, including cartographic research, the study of the agricultural/suburban interface, and forestry, soil, and geological surveys. The largest constraints of local exploitation of satellite data in Indonesia are outlined. R.B.

A90-27620* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REMOTE SENSING OF GLOBAL CHANGE
LEW ALLEN (JPL, Pasadena, CA) Signal (ISSN 0049-0474), Sept. 1989, 5 p.
Copyright

Remote sensing instruments for monitoring global changes are examined. The use of the earth observing system, a set of instrument platforms in polar, sun-synchoronous orbit that provide coverage of the entire globe, is discussed. The radar and imaging spectrometers utilized to obtain surface measurements are described. Atmospheric data is collected by the atmospheric IR sounder, the tropospheric emission spectrometer, and the stratospheric wind IR limb sounder. Consideration is given to the operation of the microwave limb sounder, the active cavity radiometer, and the TDRSS. I.F.

A90-30501* Joint Research Centre of the European Communities, Ispra (Italy).
RANCHING IN THE AMAZON BASIN - LARGE-SCALE CHANGES OBSERVED BY AVHRR
J. P. MALINGREAU (EEC, Joint Research Centre, Ispra, Italy) and C. J. TUCKER (NASA, Goddard Space Flight Center, Greenbelt, MD) International Journal of Remote Sensing (ISSN 0143-1161), vol. 11, Feb. 1990, p. 187-189.
Copyright

The contribution that AVHRR data can make to resolving the controversy about the deforestation of the Amazon region is discussed. The most significant types of information which such data can supply are pointed out. A color composite is shown and discussed, showing how it points out areas of deforestation. C.D.

A90-31776
INTERNATIONAL SYMPOSIUM ON REMOTE SENSING OF ENVIRONMENT, 22ND, ABIDJAN, COTE D'IVOIRE, OCT. 20-26, 1988, PROCEEDINGS. VOLUMES 1 & 2
Symposium organized by the Environmental Research Institute of Michigan; Supported by the U.S. Agency for International Development, CNES, NASA, et al. Ann Arbor, MI, Environmental Research Institute of Michigan, 1989, p. Vol. 1, 492 p.; vol. 2, 429 p. In English and French. For individual items see A90-31777 to A90-31832.

Various papers on remote sensing of the environment are presented. Individual topics addressed include: overview of GRID, a working global data base; topographic mapping from spot over Asela, Ethiopia; overview and status of U.S. earth-observing operational satellite plans through the 1990s; data requirements and systems for the era of sustainable development in Africa; real-world applications of integrated GIS and remote sensing; registration of remote sensing images on a reference cartography; application of remote sensing to fallow land mapping; role of remote sensing in the implementation of Africa's economic recovery programs; applying remote sensing and GIS to environmental issues in Africa; seasonal vegetation monitoring with AVHRR data for grasshopper and locust control in West Africa; monitoring

bushfires in West Africa by weather satellites; monitoring primary production in the Sahel with AVHRR observations; maximizing spectral information for West African atmospheric conditions; orthorectification of SPOT images. C.D.

A90-31781#
TWO AND A HALF YEARS OF SPOT UTILIZATION - REVIEW OF RESULTS OBTAINED TO DATE AND APPLICATION EXAMPLES [DEUX ANS ET DEMI D'EXPLOITATION DE SPOT - BILAN DES RESULTATS ET EXEMPLES D'APPLICATIONS]
JEAN MALACAMP (Spot Image, Toulouse, France) IN: International Symposium on Remote Sensing of Environment, 22nd, Abidjan, Cote d'Ivoire, Oct. 20-26, 1988, Proceedings. Volume 1. Ann Arbor, MI, Environmental Research Institute of Michigan, 1989, p. 101-117. In French.

The technical characteristics of SPOT data acquired to date are examined, with emphasis on remote-sensing observations of African countries. Attention is given to new programming features. Different types of products proposed by SPOT-IMAGE are then examined along with the commercialization network set up to distribute these products and two application examples. B.J.

A90-31788#
SEASONAL VEGETATION MONITORING WITH AVHRR DATA FOR GRASSHOPPER AND LOCUST CONTROL IN WEST AFRICA
G. G. TAPPAN, S. M. HOWARD, T. R. LOVELAND, D. J. TYLER (TGS Technology, Inc., EROS Data Center, Sioux Falls, SD), and D. G. MOORE (USGS, EROS Data Center, Sioux Falls, SD) IN: International Symposium on Remote Sensing of Environment, 22nd, Abidjan, Cote d'Ivoire, Oct. 20-26, 1988, Proceedings. Volume 1. Ann Arbor, MI, Environmental Research Institute of Michigan, 1989, p. 221-234. Research supported by the U.S. Agency for International Development. refs
(Contract USGS-14-08-0001-22521)

A90-31789#
USE OF SPOT SATELLITE IMAGES FOR THE INVENTORY AND FOLLOW-UP OF LIGNEOUS RESOURCES IN THE SAHEL
CATHERINE MERING and CHRISTINE JACQUEMINET (Office de la Recherche Scientifique et Technique d'Outre-Mer, Bondy, France) IN: International Symposium on Remote Sensing of Environment, 22nd, Abidjan, Cote d'Ivoire, Oct. 20-26, 1988, Proceedings. Volume 1. Ann Arbor, MI, Environmental Research Institute of Michigan, 1989, p. 235-250. refs

A method is described which uses the spatial resolution of SPOT images to estimate the ligneous vegetation cover of grazing areas in the Sahel and to characterize in quantitative terms the different forms of spatial organization. The satellite image is processed by different techniques such as automatic classification according to spectral criteria and morphological set transformation applied to binary images. Once an image is classified, the area covered with ligneous vegetation is evaluated and the spatial organization of spots and strips is characterized using morphological parameters such as their size distribution and their relative distribution with respect to bare areas. Quantitative descriptors of the textures are obtained that may be used to compare different types of ligneous cover. C.D.

A90-31790#
'MONITORING' BUSHFIRES IN WEST AFRICA BY WEATHER SATELLITES
SINDRE LANGAAS (Norges Landbrukshogskole, A/S, Norway) and KEITH MIURHEAD (ESA, European Space Research Institute, Frascati, Italy) IN: International Symposium on Remote Sensing of Environment, 22nd, Abidjan, Cote d'Ivoire, Oct. 20-26, 1988, Proceedings. Volume 1. Ann Arbor, MI, Environmental Research Institute of Michigan, 1989, p. 253-268. Research supported by NAF. refs

This paper deals with fires in savanna and woodland areas of West Africa and remote sensing of these fires using satellites-borne sensors. A brief description of the phenomenon and some of its resource-degradational consequences are given. The usefulness of satellite data in general, and inexpensive weather satellite data from the NOAA-N series in particular, as an information source in fire management are described and exemplified. An ongoing case study from The Gambia, utilizing data from AVHRR ch. 3. located in the mid-IR part of the electromagnetic spectrum, exemplifies and discusses one potential application, namely detection and 'monitoring' of actively burning fires. Author

A90-31805#
AN OPERATIONAL FOREST CHANGE DETECTION SYSTEM USING SPOT DATA - A CASE STUDY OVER THE MAU ESCARPMENT FOREST CENTRAL KENYA
J. L. AGATSIVA, J. P. DELSOL, S. RASSE (Department of Resource Surveys and Remote Sensing, Nairobi, Kenya), and M. POUSSE (Spot Image, Toulouse, France) IN: International Symposium on Remote Sensing of Environment, 22nd, Abidjan, Cote d'Ivoire, Oct. 20-26, 1988, Proceedings. Volume 2. Ann Arbor, MI, Environmental Research Institute of Michigan, 1989, p. 551-561. refs

A90-31816#
ESTABLISHING AN URBAN DATA BASE FROM SPOT IMAGES [AIDE A LA MISE A JOUR D'UNE BASE DE DONNEES URBAINES A PARTIR DES IMAGES DU SATELLITE SPOT]
MYRIAM ARMAND (Bureau Des Innovations Pedagogiques et des Technologies Nouvelles, Paris, France) and PHILIPPE CAMPAGNE (Institut Geographique National, Saint-Mande, France) IN: International Symposium on Remote Sensing of Environment, 22nd, Abidjan, Cote d'Ivoire, Oct. 20-26, 1988, Proceedings. Volume 2. Ann Arbor, MI, Environmental Research Institute of Michigan, 1989, p. 695-708. In French. refs

A project to develop a data base from satellite images has been initiated for the city of Bouake, Ivory Coast. These initiatives investigate the potential of urban analysis by comparison of information obtained from photointerpretation, and analysis of information drawn from imagery. These data are then applied to establishing a base to detect changes by comparison with reference images (Landsat TM January 1985) and (SPOT November 1986). The object of this study is to demonstrate the required imagery selection, compilation of varied data sources (photographs, charts, statistics tables), and management as applied to a specific city. R.E.P.

A90-31822#
ISSUES AND PROBLEMS IN THE APPLICATION OF REMOTE SENSING FOR LAND USE MAPPING IN GHANA
JONATHAN A. ALLOTEY (Environmental Protection Council, Accra, Ghana) IN: International Symposium on Remote Sensing of Environment, 22nd, Abidjan, Cote d'Ivoire, Oct. 20-26, 1988, Proceedings. Volume 2. Ann Arbor, MI, Environmental Research Institute of Michigan, 1989, p. 783-787. refs

A90-31832#
ESTIMATING DEMOGRAPHIC CHARACTERISTICS OF NAIROBI CITY FROM SATELLITE REMOTE SENSING DATA
JOHN BARAZA (Regional Centre for Services in Surveying, Mapping and Remote Sensing, Nairobi, Kenya) IN: International Symposium on Remote Sensing of Environment, 22nd, Abidjan, Cote d'Ivoire, Oct. 20-26, 1988, Proceedings. Volume 2. Ann Arbor, MI, Environmental Research Institute of Michigan, 1989, p. 875-886. refs

A90-32163
HIGH RESOLUTION STEREO PARALLAX DETERMINATION USING A NEURAL NETWORK
MICHAEL JORDAN (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) IN: Image understanding and the man-machine interface II; Proceedings of the Meeting, Los Angeles, CA, Jan. 17, 18, 1989. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1989, p. 123-130.
Copyright

Image cross correlation calculations input to a neural network are used in an attempt to determine fractional pixel parallax at each pixel location. Correlation values are obtained between image

windows in the left view with a succession of overlay window positions in the right view. A section of correlation data is input to a neural network, and the network outputs the parallax offset value for the pixel centered on the section. The network is trained using simulated stereo imagery so that the exact parallax offset at each pixel is known. A network with two 'hidden layers', and with symmetries imposed on the cell connection weights, is trained using a back-propagation method. Network results on simulated test sets show an improvement over results using correlation smoothing methods. The trained network is then used on a real image pair for elevation extraction and change detection. V.T.

A90-34261
KNOWLEDGE-BASED TECHNIQUES FOR MULTI-SOURCE CLASSIFICATION
A. SRINIVASAN (New South Wales, University, Kensington, Australia) and J. A. RICHARDS (University College, Campbell, Australia) International Journal of Remote Sensing (ISSN 0143-1161), vol. 11, March 1990, p. 505-525. refs
Copyright

The value of utilizing multiple data sources for classifying images has long been recognized in remote sensing. However, any attempts to do so have faced enormous problems primarily due to the inadequacy of traditional single source analytical techniques. This paper demonstrates the feasibility of using knowledge-based procedures to provide a new scheme for incorporating several sources in the classification process. The two schemes presented (based on numerical and qualitative reasoning) are computationally efficient and have high classification accuracies. Author

A90-35146* Oregon State Univ., Corvallis.
GLOBAL CLIMATE CHANGE AND US AGRICULTURE
RICHARD M. ADAMS (Oregon State University, Corvallis), CYNTHIA ROSENZWEIG (NASA, Goddard Institute for Space Studies, New York), ROBERT M. PEART (Florida, University, Gainesville), JOE T. RITCHIE (Michigan State University, East Lansing,), BRUCE A. MCCARL (Texas A & M University, College Station) et al. Nature (ISSN 0028-0836), vol. 345, May 17, 1990, p. 219-224. Research supported by EPA. refs
Copyright

Agricultural productivity is expected to be sensitive to global climate change. Models from atmospheric science, plant science, and agricultural economics are linked to explore this sensitivity. Although the results depend on the severity of climate change and the compensating effects of carbon dioxide on crop yields, the simulation suggests that irrigated acreage will expand and regional patterns of U.S. agriculture will shift. The impact of the U.S. economy strongly depends on which climate model is used. Author

A90-36147
MODELING OF SPACE-BASED SYSTEMS FOR STUDYING THE EARTH'S NATURAL RESOURCES [MODELIROVANIE KOSMICHESKIKH SISTEM IZUCHENIIA PRIRODNYKH RESURSOV ZEMLI]
FIR'IAZ R. KHANTSEVEROV and VLADIMIR V. OSTROUKHOV Moscow, Izdatel'stvo Mashinostroenie, 1989, 264 p. In Russian. refs
Copyright

The theoretical and practical aspects of the modeling of space-based systems for studying the natural resources of the earth are examined using multifactorial models of varying physical nature and structural complexity. The discussion covers the methodological principles of the analysis and synthesis of space systems; graphoanalytical modeling and its applications; electronic/physical modeling; and methods for the formal description of the motion of individual satellites and their groupings. Attention is also given to the optimization of the selective study of natural objects from space; mathematical models for the study of natural resources from space; and fundamentals of the systems analysis of the functional dynamics of space systems for the study of the earth's natural resources. V.L.

A90-38899
CHANGE DETECTION IN MONOCHROMATIC IMAGERY
LARRY S. DAVIS, DAVID A. HARWOOD, LING TONY CHEN, and DIANE HSU (Maryland, University, College Park) IN: Applications of artificial intelligence VII; Proceedings of the Meeting, Orlando, FL, Mar. 28-30, 1989. Part 2. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1989, p. 676-685. Research supported by ESL Corp. and DARPA.
(Contract DAAB07-86-K-F073)
Copyright

An important application of vision in aerial reconnaissance is the detection and classification of changes between images of the same scene taken at different times. In this paper, an algorithmic approach to this change detection problem is presented in which large parts of the images are first eliminated as change candidates using relatively simple photometric tests. Specifically, a pair of global linear gray scale transformations is found that are used to transform the images into one another. The first image is compared to the transform of the second, and vice-versa, with high-difference pixels being candidates for subsequent detailed analysis. C.D.

A90-40342
SOME PROBLEMS IN DESIGNING THE INFORMATION PROCESSING PROCEDURES IN DATA RECEPTION AND PROCESSING CENTERS [VOPROSY PLANIROVANIIA OBRABOTKI INFORMATSII V TSENTRAKH PRIEMA I OBRABOTKI DANNYKH]
V. L. VASIL'EV, L. A. BAZHENOVA, I. S. GORBUNOVA, and V. M. PAPIRNYI IN: Methods and equipment for the remote sensing of natural earth resources and environment. Leningrad, Gidrometeoizdat, 1989, p. 146-150. In Russian.
Copyright

This paper discusses the problem of designing the optimal plan for a center for satellite data reception and processing, where the schedule of data entry and the deadlines for data distribution to the users are specified. An algorithm is developed for the construction of the time table which guarantees that the required schedule for data processing and information distribution is met with only minimal disruptions. I.S.

A90-45607
SATELLITE DATA: PROCESSING, ARCHIVING AND DISSEMINATION. VOLUME 2 - FUNCTIONS, OPERATIONAL PRINCIPLES AND DESIGN
DAVE R. SLOGGETT (Software Sciences, Ltd., Farnborough, England) Chichester, England/Englewood, NJ, Ellis Horwood/Prentice Hall, 1989, 291 p. refs
Copyright

The design and operation of a generic data center for processing, storing, and distributing satellite remote-sensing data are considered, and specific examples describe the application of these general principles to missions such as ERS-1, the NASA Great Observatories, and the World Data Centre system. Chapters are devoted to data-center architectures, archiving satellite data, cataloging satellite data, user support, product and data dissemination, and product processing. Diagrams, maps, and flow charts are provided. T.K.

A90-46436* Ball State Univ., Muncie, IN.
ANALYSIS OF REGIONAL-SCALE VEGETATION DYNAMICS OF MEXICO USING STRATIFIED AVHRR NDVI DATA
KEVIN M. TURCOTTE, WILLIAM J. KRAMBER, GOPALAN VENUGOPAL (Ball State University, Muncie, IN), and KAMLESH LULLA (NASA, Johnson Space Center, Houston, TX) IN: 1989 ASPRS/ACSM Annual Convention, Baltimore, MD, Apr. 2-7, 1989, Technical Papers. Volume 3 - Remote Sensing. Bethesda, MD, American Society for Photogrammetry and Remote Sensing and American Congress on Surveying and Mapping, 1989, p. 246-257. refs
Copyright

Previous studies have shown that a good relationship exists between AVHRR Normalized Difference Vegetation Index (NDVI)

measurements, and both regional-scale patterns of vegetation seasonality and productivity. Most of these studies used known samples of vegetation types. An alternative approach, and the objective was to examine the above relationships by analyzing one year of AVHRR NDVI data that was stratified using a small-scale vegetation map of Mexico. The results show that there is a good relationship between AVHRR NDVI measurements and regional-scale vegetation dynamics of Mexico. Author

A90-46437
AVHRR ASSESSMENT OF PASTORAL BIOMASS IN THE SAHEL OF NIGER
JOHN A. HARRINGTON, JR. and BRUCE K. WYLIE (New Mexico State University, Las Cruces) IN: 1989 ASPRS/ACSM Annual Convention, Baltimore, MD, Apr. 2-7, 1989, Technical Papers. Volume 3 - Remote Sensing. Bethesda, MD, American Society for Photogrammetry and Remote Sensing and American Congress on Surveying and Mapping, 1989, p. 258-265. Research supported by the U.S. Agency for International Development. refs
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The development of an operational capability for rangeland vegetation assessment in Niger by utilizing the normalized difference vegetation-index (NDVI) statistics obtained from NOAA advanced very-high-resolution radiometer (AVHRR) local-area coverage (LAC) data is discussed. The ground-based vegetation data collection, main steps involved in satellite data processing, statistical correlation of satellite data with vegetation data, and progress made in institutionalization of the above methods with the government of Niger are covered. Emphasis is placed on linear regression analysis for assessing the reliability of the resource monitoring effort, access to satellite data, and development of appropriate methods for ground truth-data collection. V.T.

A90-46438* National Aeronautics and Space Administration. John C. Stennis Space Center, Bay Saint Louis, MS.
MONITORING THE INUNDATION EXTENT OF THE FLORIDA EVERGLADES WITH AVHRR DATA IN A GEOGRAPHIC INFORMATION SYSTEM
R. E. PELLETIER and D. D. DOW (NASA, John C. Stennis Space Center, Bay Saint Louis, MS) IN: 1989 ASPRS/ACSM Annual Convention, Baltimore, MD, Apr. 2-7, 1989, Technical Papers. Volume 3 - Remote Sensing. Bethesda, MD, American Society for Photogrammetry and Remote Sensing and American Congress on Surveying and Mapping, 1989, p. 266-275. Research supported by NASA. refs
Copyright

The purpose of the study is to develop a geographical information system capable of estimating methane and other greenhouse trace-gas fluxes from the wetlands of the Florida Everglades. Advanced very-high-resolution radiometer (AVHRR) data collected on a near-monthly basis for a year in order to monitor the seasonal dynamics of inundation extent across the Everglades is utilized in the analysis. It is noted that AVHRR data presents advantages over other remote-sensing data sources employed in covering large geographical regions due to its daily coverage with multiple opportunities during a day. This temporal resolution allows the realistic expectation of acquiring data on a frequent basis. V.T.

A90-47963#
USE OF SPOT DATA FOR PRELIMINARY STUDIES OF ROADS PLOTTING
JENNY GILLI (Societe d'Etudes Techniques et d'Entreprises Generales, Valbonne, France) IN: Asian Conference on Remote Sensing, 9th, Bangkok, Thailand, Nov. 23-29, 1988, Proceedings. Tokyo, Asian Association on Remote Sensing, 1988, p. D-8-1 to D-8-5.

A90-47990#
GIST - A GATEWAY TO GIS TECHNOLOGY
GEIR-HARALD STRAND (Norwegian Computing Centre, Oslo, Norway) IN: Asian Conference on Remote Sensing, 9th, Bangkok, Thailand, Nov. 23-29, 1988, Proceedings. Tokyo, Asian Association on Remote Sensing, 1988, p. S-2-1 to S-2-6.

GIST is a tutorial package for the Geographical Information Systems (GIS) that is being used in GIS courses and workshops at the Asian Institute of Technology and the Norwegian Computing Center to prepare students for future work with 'real' systems. The display layout of GIST represents three maps simultaneously, making it possible to compare maps on the screen and to compute some descriptory statistics. Manipulatory tools of the package can be used to change the distributions or the visual appearance of a map. The most important function of the GIST package is the ability to compare two maps in order to produce a third. The analysis capabilities available include different logical, arithmetic, and tabular operations based on a comparison of two input maps. GIST is designed to force students to plan their data analysis as a complete process, break it down into small steps, and carry out each of these steps separately. I.S.

A90-47993#
THE STUDY OF BANGKOK METROPOLITAN AND ITS VICINITIES USING HIGH RESOLUTION SATELLITE DATA FOR DEVELOPMENT PLANNING
UTIS BOONLUE, DUSDI CHANLIKIT, PRANEE NANTASENAMATR (Department of Town and Country Planning, Regional Planning Div., Thailand), SUVIT VIBULSRESTH, CHALOOMPORN BOON-BOOTHARA (National Research Council, Bangkok, Thailand) et al. IN: Asian Conference on Remote Sensing, 9th, Bangkok, Thailand, Nov. 23-29, 1988, Proceedings. Tokyo, Asian Association on Remote Sensing, 1988, p. S-9-1 to S-9-6.

A90-49703
REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS - TOWARDS INTEGRATED SPATIAL INFORMATION PROCESSING
MANFRED EHLERS (Maine, University, Orono) (IEEE, Canadian Remote Sensing Society, URSI, et al., Quantitative remote sensing: An economic tool for the Nineties - 1989 International Geoscience and Remote Sensing Symposium and Canadian Symposium on Remote Sensing, 12th, (IGARSS'89), Vancouver, Canada, July 10-14, 1989) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. 28, July 1990, p. 763-766. refs
(Contract NSF SES-88-10917)
Copyright

Impediments to the efficient integration of remotely sensed data with geographic information systems (GISs) are identified, and strategies to overcome them are outlined, It is suggested that the solution to the problems probably lies in the recognition that GIS data and remote-sensing data process and manage spatial information at different levels of representation. Data structures, data collection and management technologies, and institutional responses to these data are all affected by such a recognition. Ultimately, GIS and remote sensing can be viewed as one entity which is concerned with handling and analyzing spatial data. I.E.

A90-50479* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECT OF CHANGING ENVIRONMENTAL CONDITIONS ON MICROWAVE SIGNATURES OF FOREST ECOSYSTEMS - PRELIMINARY RESULTS OF THE MARCH 1988 ALASKAN AIRCRAFT SAR EXPERIMENT
JOBEA WAY, JACK PARIS (JPL, Pasadena, CA), ERIC KASISCHKE (Michigan, Environmental Research Institute, Ann Arbor), CHARLES SLAUGHTER, LESLIE VIERECK (Institute of Northern Forestry, Fairbanks, AK) et al. (CEC and JPL, International Forest Signature Workshop, Ispra, Italy, Sept. 7-9, 1988) International Journal of Remote Sensing (ISSN 0143-1161), vol. 11, July 1990, p. 1119-1144. refs
Copyright

In preparation for the ESA ERS-1 mission, a series of multitemporal, multifrequency, multipolarization aircraft SAR data sets were acquired near Fairbanks in March 1988. P-, L-, and C-band data were acquired with the NASA/JPL Airborne SAR on five different days over a period of two weeks. The airborne data

were augmented with intensive ground calibration data as well as detailed simultaneous in situ measurements of the geometric, dielectric, and moisture properties of the snow and forest canopy. During the time period over which the SAR data were collected, the environmental conditions changed significantly; temperatures ranged from unseasonably warm (1 to 9 C) to well below freezing (-8 to -15 C), and the moisture content of the snow and trees changed from a liquid to a frozen state. The SAR data clearly indicate the radar return is sensitive to these changing environmental factors, and preliminary analysis of the L-band SAR data shows a 0.4 to 5.8 dB increase (depending on polarization and canopy type) in the radar cross section of the forest stands under the warm conditions relative to the cold. These SAR observations are consistent with predictions from a theoretical scattering model. Author

A90-51384
FOREST COVER TYPE MAPPING AND DAMAGE ASSESSMENT OF ZEIRAPHIRA DINIANA BY SPOT 1 HRV DATA IN THE MERCANTOUR NATIONAL PARK
C. CHAMIGNON and R. MANIERE (Nice, Universite, France) International Journal of Remote Sensing (ISSN 0143-1161), vol. 11, Aug. 1990, p. 1439-1450. refs
Copyright

Research activity in the Mercantour National Park (located at the southeastern end of the Alpine arc) includes compilation of natural environment inventories and management actions for more effective land use. In a cooperative project with Nice University, a computerized geographical information system (GIS) involving the integration of various types of data has been established. Land cover mapping is achieved by comparing aerial infrared color photography and ground work and a supervised classification of SPOT multispectral data in order to identify the main types of land cover and determine the usefulness of high-resolution SPOT data for forest inventories such as trees species, vertical separation of vegetation, or thickness of ground cover. Identification and follow-up study of an outbreak of Zeiraphira diniana were also conducted. It is concluded that GIS data as an input is useful in selecting a sampling strategy for ground-truth data and that it appears important to use both SPOT HRV and Landsat TM data for both spatial and spectral contributions to mapping. L.K.S.

A90-52768* Maine Univ., Orono.
REMOTE SENSING OF TROPICAL FORESTS - AN OVERVIEW OF RESEARCH AND APPLICATIONS USING NON-PHOTOGRAPHIC SENSORS
STEVEN A. SADER (Maine, University, Orono), THOMAS A. STONE (Woods Hole Oceanographic Institution, MA), and ARMOND T. JOYCE (NASA, Stennis Space Center, Bay Saint Louis, MS) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 56, Oct. 1990, p. 1343-1351. Research supported by the University of Maine, Woods Hole Oceanographic Institution, and NASA. refs
Copyright

A comprehensive overview is presented on how remote sensing technology has been applied to tropical forest monitoring over the past 20 years. Research needs for monitoring the condition and extent of tropical forests are suggested. The discussion focuses on nonphotographic sensors, especially those on orbiting satellites. Several remote sensing approaches to tropical forest monitoring are outlined, including NOAA AVHRR, Landsat MSS, the Landsat Thematic Mapper, SPOT-1, and Synthetic Aperture Radar. Suggested research needs are addressed, along with discussions on the use of Geographic Information Systems, and multistage and multisensor approaches in data analysis and acquisition. It is concluded that additional research and technique development is urgently needed to advance the utility of remotely sensed data for tropical forest monitoring. However, there is sufficient information available now to prototype a global tropical forest monitoring system that would utilize current satellite sensors complemented with airborne sensors for detailed measurements on sample locations. S.A.V.

A90-52769
MANAGING DATA FOR THE MONITORING OF TROPICAL FOREST COVER - THE GLOBAL RESOURCE INFORMATION DATABASE APPROACH
SIPI JAAKKOLA (UN, Carouge, Switzerland) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 56, Oct. 1990, p. 1355-1357.
Copyright

As a UN organization for the management of global resource data, GRID believes that the world community should urgently be provided with access to timely and usable data on the condition and change of tropical forest cover. The NOAA/AVHRR satellite data acquisition system, together with the recent advances in the fields of GIS and digital image analysis, have made it technically possible. GRID has developed tropical forest cover mapping methodology in two regions, West Africa and Amazonia. A digital global map is now planned to be compiled from various research organizations' recent AVHRR-LAC data classification results covering the major part of the moist tropical forest region. In this framework GRID could contribute not only its Amazonian and West African maps but, in particular, data integration and archiving capacity and capability; ancillary data layers from GRID's global database, assisting FAO's Forest Resources Assessment 1990 with the integrated datasets; and, finally, expert advice and administrative support to above functions. Author

A90-52771* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
MAPPING CONTINENTAL-SCALE BIOMASS BURNING AND SMOKE PALLS OVER THE AMAZON BASIN AS OBSERVED FROM THE SPACE SHUTTLE
MICHAEL R. HELFERT and KAMLESH P. LULLA (NASA, Johnson Space Center, Houston, TX) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 56, Oct. 1990, p. 1367-1373. refs
Copyright

Space Shuttle and Skylab-3 photography has been used to map the areal extent of Amazonian smoke palls associated with biomass burning (1973-1988). Areas covered with smoke have increased from approximately 300,000 sq km in 1973 to continental-size smoke palls measuring approximately 3,000,000 sq km in 1985 and 1988. Mapping of these smoke palls has been accomplished using space photography mainly acquired during Space Shuttle missions. Astronaut observations of such dynamic and vital environmental phenomena indicate the possibility of integrating the earth observation capabilities of all space platforms in future Global Change research. Author

N90-12089# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (Germany, F.R.). Abteilung fuer Optische Fernerkundung.
SIGNATURE ANALYSIS AND CLASSIFICATION OF PINE OF DIFFERENT VITALITY CLASSES USING AIRBORNE THEMATIC MAPPER DATA Ph.D. Thesis - Ludwig-Maximilians Univ.
KARIN HERRMANN Feb. 1989 188 p In GERMAN; ENGLISH summary Original contains color illustrations
(DFVLR-FB-89-07; ISSN-0171-1342; ETN-89-95304; AD-B135294L) Avail: NTIS HC A09/MF A01; DFVLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Federal Republic of Germany, 78 deutsche marks

The use of the airborne thematic mapper Daedalus 1268 in assessing, mapping and monitoring forest decline areas since 1986 is described. Symptoms on Scotch pine (Pinus sylvestris L.) like chlorosis and needle loss are investigated. Spectral signatures of individual pine crowns are collected and analyzed. Procedures to optimize the classification of various damaged pine areas are developed and different verification methods are examined. ESA

N90-13885# Technische Univ., Delft (Netherlands). Satellite Geodesy Section.
PRECISION OF SEMI-GEOMETRICALLY DETERMINED SLR

BASELINES VS. SITE OCCUPATION TIME Thesis
H. E. DEZWIJGER Jul. 1988 63 p
(ETN-90-96007) Avail: NTIS HC A04/MF A01

The precision and stability of the baselines of the Satellite Laser Ranging (SLR) are investigated. The aim is to indicate that the inaccuracy in SLR data does not necessarily imply a change in the length of the site occupation time, at least for short arc analysis methods. This is done by working out the requirements of a dedicated experiment. The mathematical model is elucidated, and parameters with their influence on the satellite orbit are discussed. A formula indicating the influence of some parameters is derived. The final analysis includes: the use of one, two or three months of data, and the adjustment of inter-station baselines in one run; 10, 15, 20 or more basic analysis units (spirals). A short arc analysis is performed by using for each baseline, 5, 10 or 15 spirals. The results of the analysis and recommendations for the dedicated experiment, including site occupation time are presented. ESA

N90-16319# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (Germany, F.R.). Hauptabteilung Angewandte Datentechnik.
INTRODUCTION TO THE FRAMEWORK AND TASKS OF THE DFD [EINFUEHRUNG IN DAS UMFELD UND DIE AUFGABEN DES DFD]
WINFRIED MARKWITZ *In its* Proceedings of the 5th User Seminar of the German Remote Sensing Data Center of the DFVLR p 11-14 Feb. 1989 In GERMAN Original contains color illustrations
Avail: NTIS HC A07/MF A01; DFVLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, 52 DM

The use of the space information potential is discussed. The enormous, steadily growing information potential opens many possible tasks in the fields of environment survey, inventories, and planning, especially for public services. However, the operational use of this potential data obtained in space requires the introduction and financing of new and efficient procedures, as well as the continuity of the supply of data, national data archives, and the formation of experts. Concrete and important tasks of the DFD (Deutsches Fernerkundungsdatenzentrum, German Remote Sensing Data Center) are the participation in large international and national projects, as well as the development of methods and systems for data evaluation ESA

N90-16323# Freie Univ., Berlin (Germany, F.R.). Zentraleinrichtung fuer Audiovisuelle Methoden.
SATELLITE IMAGE SEQUENCES FOR MOTION ANALYSIS AND CHANGE DETECTION [SATELLITENBILDSEQUENZEN FUER BEWEGUNGSANALYSE UND CHANGE DETECTION]
CHRISTIAN ZICK *In* DFVLR, Proceedings of the 5th User Seminar of the German Remote Sensing Data Center of the DFVLR p 33-35 Feb. 1989 In GERMAN Original contains color illustrations
Avail: NTIS HC A07/MF A01; DFVLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, 52 DM

Techniques and representation forms were developed for change detection of remote sensing data, with a view to analysis of sequences of image data from geostationary satellites (Meteosat). Several Meteosat film scenes demonstrate the application possibilities for quantitative and qualitative cloud motion analysis. ESA

N90-16338# Statistisches Bundesamt, Wiesbaden (Germany, F.R.).
STATISTICAL INFORMATION SYSTEM FOR CULTIVATION OF THE SOIL. USE OF REMOTE SENSING IN OFFICIAL STATISTICS [STATISCHES INFORMATIONSSYSTEM ZUR BODENNUTZUNG. EINSATZ VON FERNERKUNDUNG IN DER AMTLICHEN STATISTIK]
WALTER RADERMACHER *In* DFVLR, Proceedings of the 5th User Seminar of the German Remote Sensing Data Center of the DFVLR p 101-107 Feb. 1989 In GERMAN Original contains color illustrations
Avail: NTIS HC A07/MF A01; DFVLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, 52 DM

The concept of a statistical information system for cultivation of the soil is under study. The system aims at the following characteristics: capability to process aerial pictures; satellite pictures and digital topographic maps; interpretation of aerial pictures on scale 1:32,000; as an interpretation basis the topographic maps TK25; systematic determination of cultivation types in agreement with the data users; and units of cultivation. ESA

N90-16339# Freie Univ., Berlin (Germany, F.R.). Inst. fuer Weltraumtechnik.
TM LAND USE CLASSIFICATION OF A REGION. UTILIZATION FOR PLANNING AND STATISTICS [TM LANDNUTZUNGSKLASSIFIKATION EINER REGION. NUTZEN FUER PLANUNG UND STATISTIK]
CHRISTIANE SCHMULLIUS *In* DFVLR, Proceedings of the 5th User Seminar of the German Remote Sensing Data Center of the DFVLR p 109-113 Feb. 1989 In GERMAN Original contains color illustrations
Avail: NTIS HC A07/MF A01; DFVLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, 52 DM

Satellite picture data is used for land use mapping. A land use map of the region of the Upper Rhine with 16 land use classes is digitally established based on LANDSAT-5 TM data. The analysis of the phenological situation shows that the development of vegetation is dominated by local effects. The classification accuracy of land use types is 93.8 percent. The agreement between satellite data and official land statistics is best for water surfaces and global surfaces. ESA

N90-18766# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
REMOTE SENSING APPLIED TO THE MONITORING OF MINERAL EXTRACTION IN THE PROXIMITY OF URBAN AREAS: PROS AND CONS
DALTON DEMORISSONVALERIANO Jun. 1989 13 p In PORTUGUESE; ENGLISH summary Presented at the National Meeting on Remote Sensing Applied to Municipal Planning, Campos do Jordao-SP, 22-23 Oct. 1987
(INPE-4867-PRE/1478) Avail: NTIS HC A03/MF A01

Within the economic activities that are directly related to the exploration of natural resources, quarrying is one of those that are able to cause great environmental disturbances. The lowering of the life quality standard that generally follows environmental degradation justifies the need of a relatively high frequency monitoring of mineral extraction activity when it takes place in urban fringes. Due to its inherent periodicity, spaceborne remote sensing is potentially a fundamental tool to the execution of such monitoring. Nevertheless, due to the operational peculiarities of the activities and the the variability of materials envolved in the mineral extraction, the application of remote sensing to its monitoring requires methodological attentions that are specific to each type of quarrying. These methodological aspects are discussed through the analysis of a case study: the coal mining in Southeastern Santa Catarina State. Author

N90-18770# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
REMOTE SENSING APPLIED TO VEGETATION AS SUBSIDIZED IN MUNICIPAL PLANNING
DALTON DEMORISSONVALERIANO, JOAO ROBERTO DOSSANTOS, PEDRO HERNANDEZFILHO, and VITOR CELSODECARVALHO Aug. 1989 16 p In PORTUGUESE; ENGLISH summary Presented at the National Meeting on Remote Sensing Applied to Municipal Planning, Campo do Jordao-SP, 22-23 Oct. 1987
(INPE-4908-PRE/1509) Avail: NTIS HC A03/MF A01

The rational exploration of the natural resources of a municipality must be one of the objectives of its administration. New technologies offer means and alternatives that make possible the

full utilization of the natural resources within the limits of the carrying capacity of the environment. Remote sensing of the vegetation is one of these available means. The assessment of the vegetation cover though mapping and inventories provides basic information for the establishment of polities and strategies for the development. The monitoring of the vegetation, which is made through periodic updating of its assessment, allows the evaluation of the results of politics, besides the fact that it depicts trends in the pattern of resources exploration. The applicability of the remote sensing of the vegetation to the municipal planning through the analysis of its foundations and methodological pecularities is discussed. Case studies of the Brazilian vegetation are presented in order to picture the state of art of the subject in Brazil. Author

N90-18782# European Space Agency, Paris (France).
ERS-1 EUROPEAN REMOTE SENSING SATELLITE: A NEW TOOL FOR GLOBAL ENVIRONMENTAL MONITORING IN THE 1990'S
EVERT ATTEMA, GIANNA CALABRESI, MAURIZIO FEA, RICHARD FRANCIS, and T. DUC GUYENNE, ed. Nov. 1989 40 p Original contains color illustrations
(ESA-BR-36; ISBN-92-9092-019-X; ETN-90-96298) Copyright Avail: NTIS HC A03/MF A01; ESA Publications Div., ESTEC, Noordwijk, Netherlands, 10 US dollars or 20 Dutch guilders

The First European Remote Sensing Satellite (ERS-1) is described in brochure format. Advanced microwave or radar techniques, used previously in the short Seasat mission, which enable global measurements and imaging to take place independently of clouds and sunlight conditions are described. The measurement of parameters previously not covered by satellites, including those of sea state, sea surface winds, ocean circulation and sea/ice levels, and all-weather imaging of ocean, ice and land, are covered. A ground segment overview, satellite control and operations, and data acquisition and fast processing are included. The ERS-1 has been designed to satisfy operational requirements for data products within a short timeframe. The significant contributions to the scientific study of the environment are discussed. ESA

N90-19631# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).
ESRIN
VALERIE DAVID, comp. and NORMAN LONGDON, comp. Mar. 1989 17 p Original contains color illustrations
(ESA-BR-58; ISSN-0250-1589) Avail: NTIS HC A03/MF A01

The European Space Agency (ESA) information link, ESRIN, is described. Located in Frascati, Italy, ESRIN is the Center in which data from numerous sources is acquired, processed, and archived, for use throughout ESA member states. Much of the information handled by ESRIN is in written form, except for data of the Earthnet program. Earthnet receives data from Earth observation satellites through its network of ground stations stretching form the North of Sweden to the Canary Islands. Besides Earthnet, two other sectors of activity are found on the ESRIN site: (1) the ESA information Retrieval Service (ESA-IRS) which is Europe's largest on-line information service; and (2) the Information Systems Division (ISD) which was set up in 1988 to harmonize information handling systems within ESA's programs, and with the Agency's contractors and its scientific communities. K.C.D.

N90-21451# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MONITORING VEGETATION OF BRAZIL: POTENTIALITIES OF MULTI-SENSORS APPROACH
YOSIO EDEMIR SHIMABUKURO, PEDRO HERNANDEZ FILHO, MARCOS DACOSTAPEREIRA, and JOAO ROBERTO DOSSANTOS Oct. 1989 12 p Presented at the Conference on Global Natural Resource Monitoring and Assessment: Preparing for the 21st Century, Venezia, Italy, 24-30 Sep. 1989 Submitted for publication
(INPE-4993-PRE/1555) Avail: NTIS HC A03/MF A01

The large territorial extension of Brazil (8.5 million square kilometers) makes remote sensing technology an important tool for monitoring the Brazilian natural resources. A research history has shown the application of satellite data for studying vegetation cover, primarily on a regional level, using MSS and TM/LANDSAT and more recently HRV/SPOT data. It is well known that the detailed knowledge of the geographic and seasonal patterns of terrestrial vegetation is a necessary factor to understand global climate, biospheric productivity and human impact on the environment. Currently, there are several data collection platforms with sensors of different spatial, spectral, and temporal characteristics which are very useful to study vegetation cover. The AVHRR/NOAA, for instance, having much less spatial detail than LANDSAT sensors but providing daily worldwide data collection show the great potential for monitoring global vegetation and its dynamic. On the other hand, data provided by LANDSAT and SPOT sensors have been used for regional studies. The potentialities are presented of multi-sensors (AVHRR/NOAA, MSS and TM/LANDSAT and HRV/SPOT) for monitoring vegetation of Brazil. The results of the analyzed procedures show the potential of multi-sensors for mapping, estimation of biomass, and phenology conditions of the vegetation and the human impact on the environment (deforestation, biomass burning, etc.). Author

N90-23779# Beleidscommissie Remote Sensing, Delft (Netherlands).
THE VIERS-1 PROJECT. THE DELFT WIND/WAVE EXPERIMENT: EXPERIMENT AND FIRST RESULTS, PART 1 Progress Report
D. VANHALSEMA, C. CALKOEN, B. JAEHNE, W. A. OOST, P. SNOEIJ, and S. WAAS (Heidelberg Univ., Germany, F.R.) Nov. 1989 129 p Sponsored in part by the State Baden-Wuerttemberg
(Contract ST2J-0451-C(GDF))
(BCRS-89-24-PT-1; ETN-90-96764) Avail: NTIS HC A07/MF A01

The Delft wind/wave experiment of the VIERS-1 (preparation interpretation of ERS-1 data) program, conducted in Nov. 1987 and Mar. 1988, is described. The aim of the project is the preparation for interpreting ERS-1 data and to obtain operational information on geophysical parameters. The equipment and measurement procedures used and the experimental program are examined. The processing of the data and a discussion of the first results are carried out. The future processing of the data and concluding remarks are included. ESA

N90-23785# Beleidscommissie Remote Sensing, Delft (Netherlands).
VISION OF THE REMOTE SENSING MANAGEMENT COMMISSION ON THE ESA LONG TERM EARTH OBSERVATION PROGRAM [VISIE VAN DE BCRS OP HET ESA LANGE TERMIJN PROGRAMMA VOOR AARDOBSERVATIE]
Jul. 1989 25 p In DUTCH
(BCRS-89-11; ETN-90-96760) Avail: NTIS HC A03/MF A01

The vision of the Dutch Remote Sensing Management Commission on the ESA-LTP on Earth observation is formulated with a view to the forthcoming decision making in the Netherlands concerning a possible participation in the ERS-2 program. An historical survey of the preparation and decision making concerning ESA proposals is given. The aims, strategy and the content of the ESA-LTP on Earth observation are described, and the importance for the Netherlands is outlined. The conclusions and recommendations of the Commission are given. ESA

N90-25394# Beleidscommissie Remote Sensing, Delft (Netherlands).
MAPPING AND MONITORING LAND USE AND LAND DEGRADATION IN PART OF EAST KALIMANTAN, INDONESIA, USING AEROSPACE REMOTE SENSING TECHNIQUES: A SPOT CASE STUDY Final Report
F. W. HILWIG, M. SUKARDI, and S. EKO (Bappeda, East Kalimanta, Indonesia) Jun. 1989 58 p
(BCRS-88-16B; ETN-90-96763) Avail: NTIS HC A04/MF A01

An approach elaborated to monitor land use and land degradation in transmigration areas is presented. A region around

Samarinda, East Kalimantan, is analyzed using LANDSAT and SPOT satellite data. Both visual and a computer-assisted analysis were attempted to classify landcover and obtain a measure of erosion hazards in some sample areas, leading to land degradation. SPOT imagery in the form of color composites, in a scale of 1:50,000, provided superior tools to traditional false color composites in the field to survey and map various land use classes under tropical rainforest conditions. Computer-assisted classification of land cover classes is applied. The process of land degradation was inferred. The time available did not allow to separate the determination of the factors affecting the erodability of soils in managed forest such fire, grazing, logging and road building. ESA

N90-25399# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (Germany, F.R.).
REMOTE SENSING FOR BETTER UNDERSTANDING OF THE SYSTEM EARTH
H. HAEBERLE *In* ESA, Remote Sensing and the Earth's Environment p 3-6 Mar. 1990
Copyright Avail: NTIS HC A08/MF A01; also available from EPB, ESTEC, Noordwijk, Netherlands, 40 Dutch guilders

The need to better understand the systems controlling the Earth's atmosphere is stressed. The research priorities guiding the World Climate Research Program, the Global Change Research Program and the International Geosphere-Biosphere Program are defined. Modeling, measurement and prediction techniques are described. The Earth's hydrologic and carbon cycles are discussed. The need for an Earth Observing System to which all national and international programs contribute is stressed. The recommended payload for such an Earth Observing System is presented. ESA

N90-25413# Food and Agriculture Organization of the United Nations, Rome (Italy). Environmental Monitoring Group.
OPERATIONAL SATELLITE ENVIRONMENTAL MONITORING FOR FOOD SECURITY BY FAO: THE ARTEMIS SYSTEM
JELLE U. HIELKEMA *In* ESA, Remote Sensing and the Earth's Environment p 125-134 Mar. 1990
Copyright Avail: NTIS HC A08/MF A01; also available from EPB, ESTEC, Noordwijk, Netherlands, 40 Dutch guilders

The use of data from environmental and Earth resources satellites in improving the information bases of FAO (Food and Agriculture Organization) Global Information and Early Warning System (GIEWS) is described. The ARTEMIS satellite environmental monitoring system for real and near realtime precipitation and vegetation assessment in Africa, the Near East and Southwest Asia is described. It is based on the integrated use of high frequency Meteosat and NOAA AVHRR data. The developmental status of the DIANA satellite designed to permit realtime transmission of high volume ARTEMIS data to user terminals at regional and national levels in Africa is described. ESA

N90-25416# European Space Agency. ESRIN, Frascati (Italy). Earthnet Programme Office.
FUTURE DEVELOPMENTS OF REMOTE SENSING SYSTEMS: DATA MANAGEMENT AND PROCESSING
LUIGI FUSCO *In its* Remote Sensing and the Earth's Environment p 151-158 Mar. 1990
Copyright Avail: NTIS HC A08/MF A01; also available from EPB, ESTEC, Noordwijk, Netherlands, 40 Dutch guilders

The status of remote sensing data management, with particular emphasis on the ESA Earthnet program is presented. Plans for handling the data from ERS-1 are outlined. The planned international contribution to the Space Station Polar Platforms systems is described. Details of the NASA and ESA plans for polar platforms data management and the international coordination of efforts are presented. Comparison of data handling aspects are made to illustrate the increased complexity of the systems. ESA

N90-27158*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
APPLICATIONS OF ISES FOR VEGETATION AND LAND USE
R. GALE WILSON *In its* Earth Sciences Requirements for the Information Sciences Experiment System p 169-187 Jul. 1990
Avail: NTIS HC A10/MF A02 CSCL 02/6

Remote sensing relative to applications involving vegetation cover and land use is reviewed to consider the potential benefits to the Earth Observing System (Eos) of a proposed Information Sciences Experiment System (ISES). The ISES concept has been proposed as an onboard experiment and computational resource to support advanced experiments and demonstrations in the information and earth sciences. Embedded in the concept is potential for relieving the data glut problem, enhancing capabilities to meet real-time needs of data users and in-situ researchers, and introducing emerging technology to Eos as the technology matures. These potential benefits are examined in the context of state-of-the-art research activities in image/data processing and management. Author

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

N90-18797# Pacific Northwest Lab., Richland, WA.
ENERGY MARKETS IN THE 1990'S AND BEYOND: A COMPARISON OF ENERGY INTENSITY IN THE UNITED STATES AND JAPAN
S. C. MCDONALD Oct. 1989 12 p Presented at the 11th Annual North American Conference of the International Association for Energy Economics, Los Angeles, CA, 16-18 Oct. 1989
(Contract DE-AC06-76RL-01830)
(DE90-005535; PNL-SA-17325; CONF-8910162-6) Avail: NTIS HC A03/MF A01

A comparative analysis is provided of energy intensity in the U.S. and Japan. According to aggregate International Energy Agency (IEA) data, the U.S. has one of the most energy-intensive economies while Japan has one of the least. Energy-intensity measures are constructed and examined which that are more detailed than aggregate measures used by the IEA to see if they can better explain these differences. The year chosen for this analysis is 1985. The issue of energy intensity may become particularly critical if scientific findings on global climate change and greenhouse emissions lead to negotiations on restricting carbon emissions. The burning of fossil fuels is the most important anthropogenic source of carbon emissions. As shown by this analysis, developing a consistent and fair set of goals for each country for carbon emissions, which are interlocked with energy intensity, may be a difficult task. DOE

N90-27164# AIA Research Corp., Washington, DC.
OPPORTUNITIES IN SOLAR ENERGY RESEARCH OVER THE NEXT DECADE
E. KENNETT, comp. 1 Jun. 1989 23 p
(Contract DE-FG03-88SF-17538)
(DE90-012479; DOE/SF-17538/T5) Avail: NTIS HC A03/MF A01

A sustainable energy path that relies on renewable energy sources can provide policymakers with the flexibility to cope with an uncertain national and global future. Improving market pricing signals, opening up the energy supply and energy savings business, educating society to see the true present value of future savings, and reinvigorating research and development programs will be difficult. However, those nations that accept the challenge will be rewarded with increased energy security, more stable economies, and a healthier global environment. The following report is an overview of eight trends in our society that are expected to shape

the nature of architecture at the turn of the century. These trends will have pronounced effects on the use of renewable energy in our building stock. In turn, solar energy research can provide the answers to certain questions which will arise during these changes. Changes, if understood, can also serve to accelerate the inclusion of certain technologies, as in this particular case, solar energy. DOE

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ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

A90-13241*# National Aeronautics and Space Administration, Washington, DC.
EARTH ORBITING TECHNOLOGIES FOR UNDERSTANDING GLOBAL CHANGE
LEONARD A. HARRIS, GORDON I. JOHNSTON, WAYNE R. HUDSON, and LANA M. COUCH (NASA, Office of Aeronautics and Space Technology, Washington, DC) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 10 p. refs
(IAF PAPER 89-001) Copyright

This paper considers the technology requirements needed to support the Mission to Planet Earth concept, which will consist of several sun synchronous polar platforms; a series of low-earth orbit equatorial missions, such as Space Shuttle payloads, Space-Station-attached payloads, and the Explorer-class Earth Probes; and five geostationary platforms. In particular, the technology requirements in the areas of space-based observation, data/information, and spacecraft operation are examined. I.S.

A90-13337#
THE SPACE ECOLOGICAL MONITORING OF CITIES AND SUBURBAN AREAS WITH THE USE OF 'RESOURCE-01' SATELLITE
IU. ISRAEL, IU. NOVIKOV (GK SSSR po Gidrometeorologii i Kontroliu Prirodnoi Sredy, Laboratoriia Monitoringa Prirodnoi Sredy i Klimata, Moscow, USSR), and B. SOBISHEK (Hydrometeorologicky Ustav, Prague, Czechoslovakia) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 9 p.
(IAF PAPER 89-143) Copyright

Data from the Soviet satellite, Resource-01, are used to study the sources of anthropogenic pollution and the impact of pollution in cities and suburban areas. The methodology used in the study is reviewed and results are presented from studies over Moscow and Prague. Images are presented of the pollution sources and aerosol dome over Moscow. R.B.

A90-13362#
INFORMATION SYSTEM FOR ECOLOGICAL MAPPING AND GLOBAL CHANGE DETECTION
HANS-JOACHIM LOTZ-IWEN (DLR, Wessling, Federal Republic of Germany) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 3 p.
(IAF PAPER 89-189) Copyright

An open, user-friendly, and intelligent data system for ecological mapping is being set-up by the German Aerospace Establishment (DLR) for the ISY 1992. Three requirements are discussed: (1) availability of multitemporal satellite imagery with access to databases (2) thematic evaluation of images, and (3) training courses for external users. C.E.

A90-13363#
U.S. PERSPECTIVES ON DATA MANAGEMENT FOR GLOBAL CHANGE
T. N. PYKE, JR. (NOAA, Washington, DC) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 5 p. refs
(IAF PAPER 89-191)

The Global Change Data and Information System is part of the U.S. efforts coordinated through a Global Change Research Program to create a data management system for data analysis, data interpretation, and quantitative modeling of earth system processes by the scientific community. The data information system will enable access to information on global change data sets collected by and stored in various agencies and institutions in the U.S. and other nations. A number of U.S. governmental agencies have formed an Interagency Working Group to address the need for improved data management capabilities to support global change research. The development of an adequate management framework to meet the global change challenge is required. C.E.

A90-23138* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
THREE DIMENSIONAL SIMULATION OF SPATIAL AND TEMPORAL VARIABILITY OF STRATOSPHERIC HYDROGEN CHLORIDE
JACK A. KAYE, RICHARD B. ROOD, CHARLES H. JACKMAN (NASA, Goddard Space Flight Center, Greenbelt, MD), DALE J. ALLEN, and EDMUND M. LARSON (Applied Research Corp., Landover, MD) Geophysical Research Letters (ISSN 0094-8276), vol. 16, Oct. 1989, p. 1149-1152. refs
Copyright

Spatial and temporal variability of atmospheric HCl columns are calculated for January 1979 using a three-dimensional chemistry-transport model designed to provide the best possible representation of stratospheric transport. Large spatial and temporal variability of the HCl columns is shown to be correlated with lower stratospheric potential vorticity and thus to be of dynamical origin. Systematic longitudinal structure is correlated with planetary wave structure. These results can help place spatially and temporally isolated column and profile measurements in a regional and/or global perspective. Author

A90-32124
CHANGES IN THE GLOBAL CONCENTRATION OF TROPOSPHERIC OZONE DUE TO HUMAN ACTIVITIES
ADRIAN M. HOUGH and RICHARD G. DERWENT (Atomic Energy Research Establishment, Harwell Laboratory, Didcot, England) Nature (ISSN 0028-0836), vol. 344, April 12, 1990, p. 645-648. Research supported by the Department of the Environment of England. refs
Copyright

A global tropospheric model has been used to simulate the chemistry of the preindustrial atmosphere and that of the present day. The model results for surface ozone concentrations in the preindustrial atmosphere agree with those made at the Montsouris laboratory from 1876 to 1910, and the calculated concentrations for the present day agree with recent observations of a wide range of chemical species. Estimates of the future growth in emissions of nitrogen oxides have been used to make similar calculations for the year 2020. On the basis of these estimates, the global tropospheric concentration of ozone will continue to increase at a rate faster than during the past 100 years. C.D.

A90-32147
MODEL CALCULATIONS OF THE RELATIVE EFFECTS OF CFCS AND THEIR REPLACEMENTS ON GLOBAL WARMING
DONALD A. FISHER, CHARLES H. HALES (Du Pont de Nemours and Co., Wilmington, DE), WEI-CHYUNG WANG, MALCOLM K. W. KO, and N. DAK SZE (Atmospheric and Environmental Research, Inc., Cambridge, MA) Nature (ISSN 0028-0836), vol. 344, April 5, 1990, p. 513-516. refs
Copyright

Two atmospheric models are used to assess the contributions of proposed replacements for chlorofluorocarbons as greenhouse gases. Each model simulates the chemical reactions and radiative balance of the atmosphere. The calculated effects are normalized with respect to CFC-11; the results of the two models agree

reasonably well if the assumptions about chemical lifetimes are consistent. The results show that the replacement compounds have an effect about an order of magnitude less than that of their regulated counterparts. C.D.

A90-32150
RELATIVE CONTRIBUTIONS OF GREENHOUSE GAS EMISSION TO GLOBAL WARMING
DANIEL A. LASHOF (Natural Resources Defense Council, Washington, DC) and DILIP R. AHUJA (Tata Energy Research Institute, New Delhi, India) Nature (ISSN 0028-0836), vol. 344, April 5, 1990, p. 529-531. Research supported by EPA. refs
Copyright

An index of global warming potential is proposed for methane, carbon monoxide, nitrous oxide, and CFCs relative to that of carbon dioxide. It is found, for example, that methane has, per mole, a global warming potential 3.7 times that of carbon dioxide. On this basis, carbon dioxide emissions account for 80 percent of the contribution to global warming of current greenhouse gas emissions, as compared with 57 percent of the increase in relative forcing for the 1980s. C.D.

N90-10478*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
CHARACTERIZATION AND EVALUATION OF ACID RAIN IN EAST CENTRAL FLORIDA FROM 1978 TO 1987: TEN YEAR SUMMARY REPORT
BROOKS C. MADSEN, THOMAS W. DRESCHEL, and C. ROSS HINKLE (Bionetics Corp., Cocoa Beach, FL.) Jan. 1989 42 p
(Contract NAS10-10285)
(NASA-TM-102149; NAS 1.15:102149) Avail: NTIS HC A03/MF A01 CSCL 13B

Rainfall was collected on the University of Central Florida (UCF) campus near Orlando since July 1977 and at the Kennedy Space Center (KSC), Florida since August 1977. Since November 1983, the KSC site has been affiliated with the National Atmospheric Deposition Network. Annual volume weighted pH was slightly above the 10 year mean of 4.58 during four of the past five years. Nitrate concentrations have risen somewhat during recent years while excess sulfate concentrations have remained below the 10 year mean during four of the past years. These observations hold for both the UCF and KSC data. The distribution of individual sample pH was nearly identical at UCF and KSC. Stepwise regression suggests that sulfate, nitrate, ammonium ion, and calcium play major roles in the description of rainwater acidity. Annual acid deposition and annual rainfall have varied from 30 to 50 meq/m2-yr and 100 to 180 cm/yr, respectively. Sea salt comprises about 25 percent (UCF) and greater than 50 percent (KSC) of total ionic composition. Author

N90-10479*# Environmental Research Inst. of Michigan, Ann Arbor. Advanced Concepts Div.
SPATIAL CHARACTERIZATION OF ACID RAIN STRESS IN CANADIAN SHIELD LAKES Final Report
F. J. TANIS and E. M. MARSHALL Mar. 1989 176 p
(Contract NAS5-28779)
(NASA-CR-183446; NAS 1.26:183446; E-189400-39-F) Avail: NTIS HC A09/MF A01 CSCL 13B

The lake acidification in Northern Ontario was investigated using LANDSAT TM to sense lake volume reflectance and also to provide important vegetation and terrain characteristics. The purpose of this project was to determine the ability of LANDSAT to assess water quality characteristics associated with lake acidification. Results demonstrate that a remote sensor can discriminate lake clarity based upon reflection. The basic hypothesis is that seasonal and multi-year changes in lake optical transparency are indicative of sensitivity to acidic deposition. In many acid-sensitive lakes optical transparency is controlled by the amount of dissolved organic carbon present. Seasonal changes in the optical transparency of lakes can potentially provide an indication of the stress due to acid deposition and loading. Author

N90-10482# Oak Ridge National Lab., TN. Energy Div.
INTERNATIONAL IMPACTS OF GLOBAL CLIMATE CHANGE: TESTIMONY TO HOUSE APPROPRIATIONS SUBCOMMITTEE ON FOREIGN OPERATIONS, EXPORT FINANCING AND RELATED PROGRAMS
W. FULKERSON, R. M. CUSHMAN, G. MARLAND, and S. RAYNER 21 Feb. 1989 11 p
(Contract DE-AC05-84OR-21400)
(DE89-014004; ORNL/TM-11184) Avail: NTIS HC A03/MF A01

International impacts of global climate change are those for which the important consequences arise because of national sovereignty. Such impacts could be of two types: (1) migrations across national borders of people, of resources (such as agricultural productivity, or surface water, or natural ecosystems), of effluents, or of patterns of commerce; and (2) changes to the way nations use and manage their resources, particularly fossil fuels and forests, as a consequence of international concern over the global climate. Actions by a few resource-dominant nations may affect the fate of all. These two types of international impacts raise complex equity issues because one nation may perceive itself as gaining at the expense of its neighbors, or it may perceive itself as a victim of the actions of others. DOE

N90-11350# Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.
POTENTIAL EFFECTS OF GLOBAL CLIMATE CHANGE ON THE UNITED STATES. EXECUTIVE SUMMARY. DRAFT
JOEL B. SMITH, ed. and DENNIS A. TIRPAK, ed. Oct. 1988 55 p
(PB89-161046) Avail: NTIS HC A04/MF A01; also available SOD HC $32.00 as 055-000-00280-1 CSCL 13B

Scientific theory suggests that the addition of greenhouse gases to the atmosphere will alter the global climate. The result will be increasing temperatures and consequent changes in rainfall and other weather patterns. To help identify the effects of such a climate change, Congress asked the U.S. Environmental Protection Agency to undertake two studies on the greenhouse effect. One of the studies would focus on the potential health and environmental effects of climate change including, but not be limited to the potential impacts on agricultural, forests, wetlands, human health, rivers, lakes, estuaries as well as societal impacts. The report used regional data from atmospheric models known as General Circulation Models (GCMs) as a basis for climate change scenarios. The GCMs are large models of the ocean-atmosphere system that provide the best scientific estimates of the impacts of increased greenhouse gas concentrations on climate. The GCMs generally agree concerning general global and latitudinal increases in temperature, but they disagree concerning other areas such as the location of hydrological change. The temperature changes from three different GCMs are shown both for the United States and several regions. These results are estimates of changes caused by a doubling of carbon dioxide levels. Author

N90-11351# Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.
POTENTIAL EFFECTS OF GLOBAL CLIMATE CHANGE ON THE UNITED STATES. VOLUME 1: REGIONAL STUDIES. DRAFT
JOEL B. SMITH, ed. and DENNIS A. TIRPAK, ed. Oct. 1988 289 p
(PB89-161053) Avail: NTIS HC A13/MF A02 CSCL 13B

This report is an attempt to identify the sensitivities, direction and magnitude, linkages, regional differences, national impacts, policy implications, and uncertainties among the effects of global climate warming. It focuses on several systems that may be particularly affected by climate change: sea level rise, water resources, agriculture, forests, biodiversity and wildlife, energy demand, air pollution and health. This volume 1 contains an introduction to global climate change, the methodology used to study climate change and findings for California, the Great Lakes, the Southeast U.S., and the Great Plains. K.C.D.

N90-11352# Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.
POTENTIAL EFFECTS OF GLOBAL CLIMATE CHANGE ON THE UNITED STATES. VOLUME 2: NATIONAL STUDIES. DRAFT
JOEL B. SMITH, ed. and DENNIS A. TIRPAK, ed. Oct. 1988 414 p
(PB89-161061) Avail: NTIS HC A18/MF A03 CSCL 13B

This report is an attempt to identify the sensitivities, direction and magnitude, linkages, regional differences, national impacts, policy implications, and uncertainties among the effects of global climate warming. It focuses on several systems that may be particularly affected by climate change. This volume contains chapters on water resources, sea level rise, agriculture, forests, biological diversity, air quality, human health, urban infrastructure, climate variability, electricity demands and research needs.
K.C.D.

N90-11354# Environmental Protection Agency, Washington, DC. Information Management and Services Div.
STRATOSPHERIC OZONE DEPLETION
May 1989 72 p
(PB89-207476; EPA/IMSD-89/001) Avail: NTIS HC A04/MF A01 CSCL 13B

The bibliography focuses solely on stratospheric ozone depletion. Global climate change, a related issue, is not within its scope. The first section contains an overview of stratospheric ozone issues. The second section, entitled science, discusses atmospheric chemistry and dynamics, specifically trace gas emissions and ozone/UVB levels. The third section contains citations relating to risk assessment for humans and other organisms. Section IV includes information on domestic and international public policy. The fifth section outlines research on substitutes and alternatives for ozone-depletion substances. World-wide participants in the Montreal Protocol are listed in the Appendix.
GRA

N90-12101*# National Academy of Sciences - National Research Council, Washington, DC.
OZONE DEPLETION, GREENHOUSE GASES, AND CLIMATE CHANGE
HAROLD A. MOONEY, D. JAMES BAKER, JR., FRANCIS P. BRETHERTON, KEVIN C. BURKE, WILLIAM C. CLARK, MARGARET B. DAVIS, ROBERT E. DICKINSON, JOHN IMBRIE, THOMAS F. MALONE, MICHAEL B. MCELROY (Harvard Univ., Cambridge, MA.) et al. 1989 135 p Sponsored in part by NASA, NSF, NOAA, Dept. of Agriculture, DOD, DOE, Dept. of the Interior, DOT, and EPA
(Contract NA87-AA-D-CP041)
(NASA-CR-185323; NAS 1.26:185323; LC-88-31544; ISBN-0-309-03945-2) Avail: NTIS HC A07/MF A01 CSCL 13/2

This symposium was organized to study the unusual convergence of a number of observations, both short and long term that defy an integrated explanation. Of particular importance are surface temperature observations and observations of upper atmospheric temperatures, which have declined significantly in parts of the stratosphere. There has also been a dramatic decline in ozone concentration over Antarctica that was not predicted. Significant changes in precipitation that seem to be latitude dependent have occurred. There has been a threefold increase in methane in the last 100 years; this is a problem because a source does not appear to exist for methane of the right isotopic composition to explain the increase. These and other meteorological global climate changes are examined in detail.
E.R.

N90-12107# Oak Ridge National Lab., TN.
POLICIES TO ENCOURAGE PRIVATE SECTOR RESPONSES TO POTENTIAL CLIMATE CHANGE
ROBIN A. CANTOR, DONALD W. JONES, PAUL N. LEIBY, and STEVE RAYNER 1989 12 p Presented at the 11th Annual North American Conference of the International Association for Energy Economists, Los Angeles, CA, 16-18 Oct. 1989
(Contract DE-AC05-84OR-21400)
(DE89-017244; CONF-8910162-3) Avail: NTIS HC A03/MF A01

The Oak Ridge National Laboratory (ORNL) recently completed work on a report commissioned by the U.S. Congress from the Department of Energy entitled, A Compendium of Options for Government Policy to Encourage Private Sector Responses to Potential Climate Change, (US DOE 1989). Four classes of incentives (regulatory, fiscal, informational, and RD and D) were surveyed in the context of greenhouse-related activities in five economic sectors. For each activity general policies and specific options were considered. The paper presented here does not summarize the DOE study but identifies some of the lessons ORNL staff learned during the study about policies to deal with potential global warming.
DOE

N90-12110# National Academy of Sciences - National Research Council, Washington, DC. Commission on Physical Sciences, Mathematics and Resources.
OZONE DEPLETION, GREENHOUSE GASES, AND CLIMATE CHANGE
1989 137 p
(PB89-216097; LC-88-31544; ISBN-0-309-03945-2) Avail: NTIS HC A07/MF A01 CSCL 13/2

Ozone depletion in the stratosphere and increases in greenhouse gases in the troposphere are both subjects of growing concern-even alarm-among scientists, policymakers, and the public. At the same time, recent data show that these atmospheric developments are interconnected and in turn profoundly affect climatic conditions. To arrive at a better understanding of this complex relationship, major institutions in the field of atmospheric study convened a symposium of noted researchers. Here, researchers present the results of their most recent research, with the most up-to-date data and theories available on ozone depletion, greenhouse gases and climatic change.
Author

N90-12111# Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.).
OZONE RESEARCH PROGRAM (GERMAN CONTRIBUTION TO CLIMATE AND ATMOSPHERE RESEARCH) [OZONFORSCHUNGSPROGRAMM. DEUTSCHER BEITRAG ZUR KLIMAT UND ATMOSPHAERENFORSCHUNG]
20 Dec. 1988 43 p In GERMAN
(REPT-46-88; ETN-89-94621) Avail: NTIS HC A03/MF A01

The plans for coordinated research activities in the Federal Republic of Germany aiming at the explanation of chemical and dynamic processes in the stratosphere are outlined. The main goals are the determination of the type and importance of the ozone concentration change, the explanation of the origins of this change, and reliable predictions of future evolutions. This requires common and coordinated efforts in field measurements, laboratory studies, and the further development of multidimensional, coupled chemical and dynamic models as well as the diagnosis of available meteorological data.
ESA

N90-12979# Oak Ridge National Lab., TN.
CONTRIBUTION OF DEFORESTATION TO ATMOSPHERIC CO2 AND REFORESTATION AS AN OPTION TO CONTROL CO2
JOHN D. KINSMAN (Edison Electric Inst., Washington, DC.) and GREG MARLAND 1989 29 p Presented at the 82nd Air and Waste Management Association Annual Meeting and Exhibition, Anaheim, CA, 25-30 Jun. 1989
(Contract DE-AC05-84OR-21400)
(DE89-017255; CONF-890692-20) Avail: NTIS HC A03/MF A01

Various aspects are discussed of global climate change as related to forests: the rate of deforestation; CO2 emissions resulting from deforestation; and reforestation as a means to control atmospheric CO2. For perspective, a discussion is included of current policy considerations related to methods for reducing deforestation or promoting reforestation.
DOE

N90-12980*# National Academy of Sciences - National Research Council, Washington, DC. Committee on Global Change.
TOWARD AN UNDERSTANDING OF GLOBAL CHANGE: INITIAL PRIORITIES FOR US CONTRIBUTIONS TO THE INTERNATIONAL GEOSPHERE-BIOSPHERE PROGRAM Final Report
Dec. 1988 226 p Sponsored by NASA, Washington, DC; NOAA, Rockville, MD and Geological Survey, Reston, VA
(Contract NSF OCE-87-13699)
(NASA-CR-185873; NAS 1.26:185873; PB89-231344) Avail: NTIS HC A11/MF A02 CSCL 13/2

A limited number of high-priority research initiatives are recommended for early implementation as part of the U.S. contribution to the preparatory phase of the International Geosphere-Biosphere Program. The recommendations are based on the committee's analysis of the most critical gaps in the scientific knowledge needed to understand the changes that are occurring in the earth system not being addressed by existing programs. The report articulates a number of important key issues and interactions that characterize global change in the geosphere-biosphere system on time scales of decades to centuries; identifies the knowledge that is the most urgently needed to improve understanding of those issues and interactions; and formulates initial priorities for initial U.S. contributions to the IGBP, recognizing the contributions of other ongoing and proposed programs. Author

N90-12981# Systems Applications, Inc., San Rafael, CA.
SENSITIVITY OF A REGIONAL OXIDANT MODEL TO VARIATIONS IN CLIMATE PARAMETERS, VOLUME 1 AND 2 Final Report
R. E. MORRIS, M. W. GERY, M. K. LIU, G. E. MOORE, C. DALEY, and S. M. GREENFIELD Jul. 1989 149 p Sponsored by EPA, Research Triangle Park, NC
(PB89-224943; EPA/600/3-89/068-VOL-1/2) Avail: NTIS HC A07/MF A01 CSCL 13/2

In order to investigate the sensitivity of ozone concentrations to future climate variations, a regional oxidant model was applied for future climate scenarios to two regions: one covering central California (San Joaquin Valley, Sierra Nevada mountains and the San Francisco Bay Area) and the other covering the midwestern and southeastern United States. Based on model calculations, the effects of increased temperature on ambient ozone concentrations results in an increase of the area of exceedances of the ozone air quality standard, a movement of the peak ozone concentration closer to the urban areas, and the resultant increase in the exposure of people to harmful levels of ozone concentrations. The calculations for California indicate that the maximum daily ozone concentrations may increase from 2 to 20 percent and the number of people exposed to hourly ozone concentrations in excess of the air quality standard may triple as a result of a temperature increase. Similar, although less dramatic, results were seen for the midwestern and southeastern applications. GRA

N90-12982# Valley Research Corp., Van Nuys, CA.
DEVELOPMENT OF AN INVENTORY OF MATERIALS POTENTIALLY SENSITIVE TO AMBIENT ATMOSPHERIC ACIDITY IN THE SOUTH COAST AIR BASIN Final Report
YUJI HORIE, ARTHUR SHROPE, and RICHARD ELLEFSEN (San Jose State Univ., CA.) Mar. 1989 234 p
(Contract ARB-A6-079-32)
(PB89-224604; ARB-R-89/399) Avail: NTIS HC A11/MF A02 CSCL 13/2

An inventory of exposed materials for residential and nonresidential buildings and nonbuildings was developed. The inventory of the residential buildings was developed by conducting telephone surveys of 1,200 households and field surveys of 200 households. The inventory of multi-family residential buildings and nonresidential buildings was conducted by aerial photo analysis. The inventory of nonbuilding materials (infrastructure) was developed by conducting a limited survey and by using engineering calculations. The inventory was extrapolated to the entire South Coast Air Basin using the building-count method. Author

N90-14702# Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
AN EVALUATION OF TREND DETECTION TECHNIQUES FOR USE IN WATER QUALITY MONITORING PROGRAMS
JIM C. LOFTIS, ROBERT C. WARD, RONALD D. PHILLIPS, and CHARLES H. TAYLOR Mar. 1989 150 p Sponsored by US Environmental Protection Agency, Corvallis, OR
(PB89-100058; EPA/600/3-89/037) Avail: NTIS HC A07/MF A01 CSCL 13/2

Information goals for a long term water quality monitoring program to measure the impacts due to acid precipitation were developed using the Acid Precipitation Act of 1980 (PL 96-294, Title VII) as a basis. These broad information goals were refined to obtain statistical hypotheses for which statistical tests could be employed as part of a data analysis plan. Seven statistical tests were identified as capable of providing the desired information regarding trends in individual systems. The tests were evaluated under various conditions (i.e., distribution shape, seasonality and serial correlation) in order to determine how well they might perform as part of a data analysis plan. A Monte Carlo simulation approach was used to evaluate the tests. For annual sampling, the Kendall-tau (also known as the Mann-Kendall) test is recommended. For seasonal sampling, the Seasonal Kendall or analysis of covariance (ANOCOV) on rank tests are recommended. Author

N90-14708# Committee on Commerce, Science, and Transportation (U.S. Senate).
CONSUMER OZONE PROTECTION ACT OF 1989
1989 107 p Hearing on S. 870 before the Subcommittee on the Consumer of the Committee on Commerce, Science and Transportation, 101st Congress, 1st Session, 19 Oct. 1989
(S-HRG-101-377; GPO-24-159) Avail: Subcommittee on the Consumer, Senate, Washington, D.C. 20510 HC free; SOD HC $3.25 as 552-070-07449-0

Hearings before a subcommittee of the Senate Committee on Commerce, Science, and Transportation are presented in regard to the labeling of consumer products containing substances that contribute to the depletion of the ozone layer in the upper atmosphere; regulation of the sale, distribution, and use of such substances in consumer products and services in and affecting interstate commerce; and recapture and recycling of such substances, and for other purposes. B.G.

N90-14709# Pacific Northwest Lab., Richland, WA.
GLOBAL ENERGY AND THE GREENHOUSE ISSUE
MICHAEL J. SCOTT, JAMES A. EDMONDS, MARK A. KELLOGG, and ROBERT W. SCHULTZ Sep. 1989 20 p Presented at the 14th World Energy Conference, Montreal, Quebec, 17-22 Sep. 1989
(Contract DE-AC06-76RL-01830)
(DE90-001394; PNL-SA-16496-1; CONF-890901-1) Avail: NTIS HC A03/MF A01

Global energy production and use results in the release of CO2 and other gases to the atmosphere which affect the atmosphere's radiative character. The accumulation of CO2 and other radiatively important gases (RIGs) is thought to result in higher mean global surface temperatures and other climatic changes, whose character would vary regionally around the globe. Of critical importance to determining the timing and magnitude of global climate change is an understanding of long term global energy systems. DOE

N90-14712# Oak Ridge National Lab., TN.
THE IMPACT OF GLOBAL WARMING ON THE ENERGY SYSTEM
WILLIAM FULKERSON 1989 35 p Presented at the 2nd University of California Global Climate Change Workshop, Davis, CA, 6 Sep. 1989
(Contract DE-AC05-84OR-21400)
(DE89-017775; CONF-8909192-1) Avail: NTIS HC A03/MF A01

One of the most important impacts of global warming may be the changes in the energy system which result not from warming

per se but from societal reactions to the prospect of warming. Changing the energy system from being 80 percent dependent on fossil fuels will be difficult at best and expensive. In fact, none of the nonfossil energy sources are yet ready to substitute for fossil fuels at the massive scale required or at reasonable costs. So, for the near to mid-term the best strategy for moderating the rate of increase of CO2 in the atmosphere is by much more efficient use and conversion of energy. Nevertheless, sustained reduction of emissions requires better nonfossil sources and expanded RD and D efforts necessary to provide the insurance we need. It is evidenced that a combined public and private sector investment of $1 (times) 10(sup 6)/year is needed. This compares to the current level of energy R and D which is estimated to cost in the range of $3 to 6 billion/year. Thus, our insurance is about a 16 to 33 percent increase. The investment is likely to yield good returns in the form of improved technologies which will be useful whether or not the changing greenhouse effect is as serious as many fear. DOE

N90-14714# Oak Ridge National Lab., TN. Environmental Sciences Div.
APPLICATION OF SURFACE ANALYSIS METHODS TO STUDIES OF ATMOSPHERIC DEPOSITION IN FORESTS
S. E. LINDBERG 1989 16 p Presented at the International Congress on Forest Decline Research: State of Knowledge and Perspectives, Friedrichshafen, Fed. Republic of Germany, 2-6 Oct. 1989
(Contract DE-AC05-84OR-21400)
(DE90-000562; CONF-8910122-1) Avail: NTIS HC A03/MF A01

Various surface analysis methods have been applied to the quantification of dry and total atmospheric deposition in recent years. Several of these methods have proved very useful in studies over large spatial and temporal scales, where application of atmospheric methods are limited. The methodology, assumptions, and applications of some of these methods are reviewed here, and examples provided of recent results. Some of these methods can provide the field data necessary for: (1) testing of regional deposition models, (2) development of process-level models of in-canopy dry deposition, and (3) comparison with results of applications of micrometeorological methods to deposition in complex terrain. These methods involve some assumptions which have not been rigorously tested and require further evaluation. DOE

N90-14715# Lawrence Livermore National Lab., CA. Atmospheric and Geophysical Sciences Div.
CLIMATE PROJECTIONS WITH REGIONAL RESOLUTION
MICHAEL C. MACCRACKEN Aug. 1989 15 p
(Contract W-7405-ENG-48)
(DE90-000858; UCID-21769) Avail: NTIS HC A03/MF A01

The increasing atmospheric concentrations of carbon dioxide and other radiatively active gases will enhance the ability of the atmosphere to trap infrared radiation and thereby lead to warming of the climate. Numerical models suggest that the global average surface air temperature can be expected to increase a few degrees during the twenty-first century. This estimate is probably uncertain by a factor of at least two. The uncertainties in estimates of regional changes of temperature and precipitation are even greater. Despite these uncertainties, there is broad agreement that the persistence of such changes would be unprecedented in historical times. DOE

N90-14718# Oak Ridge National Lab., TN. Environmental Sciences Div.
DISCUSSIONS OF GLOBAL ENVIRONMENTAL PROBLEMS
BERNHARD KRAHL-URBAN (Kernforschungsanlage, Juelich, Germany, F.R.) 2 Nov. 1989 5 p Meeting held in Oak Ridge, TN, 16-20 Oct. 1989
(Contract DE-AC05-84OR-21400)
(DE90-002747; ORNL/FTR-3452) Avail: NTIS HC A01/MF A01

A West German scientist visited the Oak Ridge National Laboratory (ORNL) at the request of the Environmental Sciences Division to provide programmatic interpretations and technical overviews of research topics addressing international environmental issues. Many of today's environmental problems can no longer be considered as regional-scale impacts. Global warming, acidification, ozone depletion, drought, deforestation, and air pollution effects are global-level processes that can only be effectively approached by international scientific cooperation. The visitor's recommendations for the final planning and coordination of international environmental issues emphasized focusing on international cooperation with research institutions in West Germany and in other countries of the European Community. Several key global environmental issues are addressed by the Juelich Nuclear Research Center (KFA Juelich), West Germany. Scientific cooperation with KFA Juelich should be promising in theoretical ecology, systems analysis, and toxicology. Scientific exchange between ORNL and KFA Juelich in environmental sciences was initiated by the visitor. DOE

N90-14721# Lawrence Livermore National Lab., CA.
QUANTIFYING THE LINK BETWEEN CHANGE IN RADIATIVE BALANCE AND ATMOSPHERIC TEMPERATURE
MICHAEL C. MCCRACKEN, ed. Aug. 1989 16 p Presented at the DOE Carbon Dioxide Research Program Workshop, Germantown, MD, 24-25 Apr. 1989
(Contract W-7405-ENG-48)
(DE90-000819; UCRL-101736; CONF-8904276-1) Avail: NTIS HC A03/MF A01

There has been a seemingly increasing divergence between the observed warming of about 0.5 C over the past 100 years and the estimates of the most recent climate model simulations that a doubling of the carbon dioxide concentration will lead to an increase in global average temperatures of perhaps 1.5 to 5 C. While there are many factors to consider in attempting to reconcile these different quantities (e.g., ocean thermal lag, atmospheric composition changes, volcanic aerosols, etc.), the level of uncertainty in estimates of future climate change clearly needs to be reduced. The purpose of this workshop was to solicit scientific counsel as part of the process of developing a new research effort to quantify the link between increasing greenhouse gases and climate change. This program of research would stress observations, field experiments and laboratory approaches as a means of resolving the apparent inconsistencies between the climate model predictions of the expected climate change to date and the observed climate system, as well as seeking to reduce the large uncertainties evident in recent studies of the treatment of cloud feedbacks. The objective of the workshop was to review the state-of-the-art for measuring the radiative balance and to explore possible experiments to link the cause and effect from changes in atmospheric composition to atmospheric temperature and other measures of climate change. DOE

N90-14722# Oak Ridge National Lab., TN. Environmental Sciences Div.
STRATEGY FOR MONITORING THE EFFECTS OF LAND USE CHANGE ON ATMOSPHERIC CO2 CONCENTRATIONS
VIRGINIA H. DALE 1989 11 p Presented at the Global Natural Resource Monitoring and Assessments: Preparing for the 21st Century, Venice, Italy, 24-30 Sep. 1989
(Contract DE-AC05-84OR-21400)
(DE90-001635; CONF-8909243-1) Avail: NTIS HC A03/MF A01

Land use changes may be responsible for as much as 50 percent of the increase in atmospheric CO2 that is thought to be causing climatic warming. The major cause of current land use is tropical deforestation. Estimating the rates of tropical deforestation is difficult, and, thus there is high uncertainty as to its contribution to atmospheric CO2. Remote sensing data can provide an independent, relatively quick, and spatially disaggregated estimate of the amount of clearing that is occurring. DOE

N90-14723# Department of Energy, Washington, DC. Office of Health and Environmental Research.
CARBON DIOXIDE AND CLIMATE: SUMMARIES OF RESEARCH IN FY 1989

Oct. 1989 87 p
(DE90-001791; DOE/ER-0425) Avail: NTIS HC A05/MF A01

Scientific and public interest in greenhouse gases, climate warming, and global change has virtually exploded in 1989. The Department's focused research on CO2 contributed sound and timely scientific information to the myriad of questions produced by the groundswell of interest and concern. Research projects summarized provided the data base that made timely responses possible, and the contributions from participating scientists are genuinely appreciated. The nation's interest has been well served. In the past year, the core CO2 research has continued to improve the scientific knowledge needed to project future atmospheric CO2 concentrations, to estimate climate sensitivity, and to assess the responses of vegetation to rising concentrations of CO2 and climate change. The Carbon Dioxide Research Program's goal is to develop sound scientific information for policy formation and governmental action in response to changes of atmospheric CO2. During this year, the Program was moved into the Office of Health and Environmental Research and was combined with other atmospheric research activities. The work is now administered by the Atmosphere and Climate Research Division (ACRD). In addition to supporting core CO2 research and developing a program around the new initiatives, ACRD is responsible for atmospheric science and climate. Its scope includes atmospheric chemistry, numerical modeling, laboratory studies, and field experiments. This Program Summary describes projects funded by the Carbon Dioxide Research Program during FY 1989 and gives a brief overview of the objectives, organization, and accomplishments of that research. DOE

N90-14724# Argonne National Lab., IL.
US ENERGY USE: NEW TECHNOLOGIES AND POLICIES IN RESPONSE TO GLOBAL WARMING
D. G. STREETS, C. N. BLOYD, and D. M. KENSKI Jun. 1989 39 p Presented at the Conference on Responding to the Threat of Global Warming: Options for the Pacific and Asia, Honolulu, HI, 21-27 Jun. 1989
(Contract W-31-109-ENG-38)
(DE90-002170; CONF-8906244-1) Avail: NTIS HC A03/MF A01

Energy use and production accounts for by far the largest portion of emissions of greenhouse gases in the United States and the world. The US Environmental Protection Agency (EPA) has estimated that, worldwide, these activities were responsible for 57 percent of greenhouse warming in the 1980s. Other activities and their respective contributions include agriculture, 14 percent; land use and modification, 9 percent; chlorofluorocarbon (CFC) use, 17 percent; and other (nonenergy) industry, 3 percent. Given this importance of energy activities, it is appropriate that efforts to forestall global warming have focused on these activities. Because the United States consumes the largest share of world energy and thus produces the largest share of greenhouse gas emissions, it is the target of many such efforts. A number of U.S. government responses to global warming have been proposed or are now under way. For example, the 101st Congress has seen 11 bills dealing with global warming issues; a research program on climate change has been promised $190 million for 1990; and the United States has signed the Montreal Protocol to control CFCs. U.S. energy and related emissions of greenhouse gases is discussed. Energy use in each sector is briefly characterized and several new technologies for energy use in that sector are described. Finally, national and state policies that offer potential to reduce energy use are discussed. This discussion is limited by space considerations to only a sampling of the many technologies under development and policy options that have been proposed. DOE

N90-15533# Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
LONG-TERM WORLDWIDE ENVIRONMENTAL EFFECTS CAUSED BY ACID RAIN FROM FOSSIL FUELS
B. MANOWITZ and F. W. LIPFERT 1989 16 p Presented at the International Workshop on Safety of Nuclear Installations of the Next Generation and Beyond, Chicago, IL, 28-31 Aug. 1989
(Contract DE-AC02-76CH-00016)
(DE90-001534; BNL-43240; CONF-890841-2) Avail: NTIS HC A03/MF A01

Acid rain is regarded as an environmental problem of growing importance in many parts of the world; it is one of the adverse effects of air pollution. This paper presents data on emissions of air pollutants from combustion of fossil fuels and discusses atmospheric processes that act on these emissions, various effects of air pollution and acid deposition, and some of the aspects of regulation of these pollutants. Evidence of worldwide concern is shown by contrasting the perceived adverse effects of air pollution with ambient levels and the status of regulation. DOE

N90-15534# Pacific Northwest Lab., Richland, WA.
INTERNATIONAL ASPECTS OF RESTRICTIONS OF OZONE-DEPLETING SUBSTANCES
S. C. MCDONALD Oct. 1989 54 p
(Contract DE-AC06-76RL-01830)
(DE90-001813; PNL-7163) Avail: NTIS HC A04/MF A01

This report summarizes international efforts to protect stratospheric ozone. Also included in this report is a discussion of activities in other countries to meet restrictions in the production and use of ozone-depleting substances. Finally, there is a brief presentation of trade and international competitiveness issues relating to the transition to alternatives for the regulated chlorofluorocarbons (CFCs) and halons. The stratosphere knows no international borders. Just as the impact of reduced stratospheric ozone will be felt internationally, so protection of the ozone layer is properly an international effort. Unilateral action, even by a country that produces and used large quantities of ozone-depleting substances, will not remedy the problem of ozone depletion if other countries do not follow suit. DOE

N90-15535# Lawrence Livermore National Lab., CA. Atmospheric and Geophysical Sciences Div.
GREENHOUSE GASES: CHANGING THE GLOBAL CLIMATE
MICHAEL C. MACCRACKEN Sep. 1989 20 p Presented at the 9th Session of the International Seminars on Nuclear War, Erice, Italy, 19-24 Aug. 1989
(Contract W-7405-ENG-48)
(DE90-002788; UCRL-101837; CONF-8908182-1) Avail: NTIS HC A03/MF A01

The increasing atmospheric concentrations of carbon dioxide and other radiatively active gases will enhance the ability of the atmosphere to trap infrared radiation and thereby lead to warming of the climate. Numerical models suggest that the global average surface air temperature can be expected to increase a few degrees during the 21st century. This estimate is probably uncertain by a factor of at least two. The uncertainties in estimates of regional changes of temperature and precipitation are even greater. Despite these uncertainties, there is broad agreement that the persistence of such changes would be unprecedented in historical times. To moderate the projected climatic and environmental changes, the rate of emissions of greenhouse gases must be slowed while alternative energy technologies are developed. DOE

N90-15538# State Univ. of New York, Albany. Research Foundation.
RESEARCH PROJECT ON CO2-INDUCED CLIMATE CHANGE Progress Report
ROBERT D. CESS and SULTAN HAMEED 1989 9 p
(Contract DE-FG02-85ER-60314)
(DE90-003531; DOE/ER-60314/T1) Avail: NTIS HC A02/MF A01

The following pages summarize the work completed to date in the second year of the Research Project on CO2-Induced Climate Change which is funded by the Department of Energy. The three major areas of study are discussed separately. The first task deals with an intercomparison of general circulation model capabilities with the aim of improving their parameterizations of important physical processes, so that model predictions of CO2 induced climate change become more reliable. Task 2 encompasses analysis of climate data for the purpose of understanding climate

change and climate variability. The third task is concerned with analyzing climatic variability in General Circulation Models and its comparison with observations. DOE

N90-15539# Argonne National Lab., IL. Environmental Assessment and Information Sciences Div.
RESPONDING TO THE THREAT OF GLOBAL WARMING: OPTIONS FOR THE PACIFIC AND ASIA
NEELOO BHATTI, DAVID G. STREETS, and TOUFIQ A. SIDDIQI (Environment and Policy Inst., Honolulu, HI.) 1989 22 p Presented at the Symposium on Environmental Perspectives Towards the Year 2000 and Beyond, Bangkok, Thailand, 9-10 Nov. 1989
(Contract W-31-109-ENG-38)
(DE90-003553; CONF-8911110-2) Avail: NTIS HC A03/MF A01

During the past few years, global climate change was rapidly transformed from an esoteric topic of interest mainly to scientists to one of worldwide concern to policymakers, the business communities, the media, and the general public. In response to this heightened interest, a number of high-level international meetings dealing with this issue were held in the past two years. With growing recognition that the global climate change phenomenon would result in different regional (and local) effects, a workshop was organized by Argonne National Laboratory and the East-West Center to assess the likely consequences of this threat and the possible remediation options available to the countries of the Pacific Asia. The deliberations and conclusion of the workshop are summarized. DOE

N90-15540# Oak Ridge National Lab., TN. Environment Sciences Div.
GLOBAL CLIMATE CHANGE AND NEPA (NATIONAL ENVIRONMENTAL POLICY ACT) ANALYSES
ROBERT M. CUSHMAN, DONALD B. HUNSAKER, JR., MARTHA S. SALK, and ROBERT M. REED 1989 25 p Presented at the The Scientific Challenge of NEPA: Future Directions Based on 20 Years of Experience, Knoxville, TN, 24-27 Oct. 1989
(Contract DE-AC05-84OR-21400)
(DE90-003704; CONF-891098-4) Avail: NTIS HC A03/MF A01

Energy production and use, industrial activity, and land-use change are expected to cause a global climate change that would have local and regional manifestations during the next century. Although the resulting impacts are not yet known with certainty, potential effects on agriculture, water, forests, ecosystems, fisheries, coastal areas (from rising sea level), and other environmental resources have been predicted. The National Environmental Policy Act of 1969 (NEPA) provides for consideration of such topics as global climate change. However, the implementation of the environmental impact statement (EIS) requirements of NEPA has seldom been used to address the issue. Climate change and its consequent effects have three important implications for NEPA determinations: (1) the potential for an action to individually alter climate must be assessed, (2) cumulative impacts of the action in concert with other actions must be considered, and (3) the potential for future climate change to alter the baseline environment (and thus to affect the action or to alter the impact of the action) must be assessed, even if the action under consideration will not in itself contribute to climate change. In this paper, we evaluate the climate-change issue (including the uncertainty of the temporal and spatial distribution of impacts) in a NEPA context. We discuss the kinds of actions to which NEPA is applicable, the types of analyses that might be appropriate, and the problems they might involve. In particular, the opportunities and limitations under current Council on Environmental Quality regulations for addressing climate change through the environmental assessment (EA)/EIS process are addressed. We also discuss changes that have been proposed for NEPA and its implementing regulation and how they could affect the analysis of global climate change. DOE

N90-15541# Argonne National Lab., IL.
GLOBAL CLIMATE CHANGE: A FOSSIL ENERGY PERSPECTIVE
ROBERT KANE (Department of Energy, Washington, DC.) and DAVID W. SOUTH 1989 7 p Presented at the 6th International Coal Trade, Transportation and Handling Conference, London, England, 16-18 Oct. 1989
(Contract W-31-109-ENG-38)
(DE90-003770; CONF-891080-1) Avail: NTIS HC A02/MF A01

Global climate change has attracted considerable attention recently as an emerging environmental problem. While substantial uncertainties still exist regarding the ability to accurately predict climate change, some scientists and policymakers believe immediate action is required. As a result, legislative proposals have been introduced and policies/programs proposed to address the perceived problem. Since fossil fuel combustion has been identified as a major contributor to the growth in atmospheric greenhouse gases, curtailing the emissions from fossil-fired facilities is a primary focus of many proposals. This paper discusses global climate change from a fossil, energy development and utilization perspective and demonstrates that if it is determined that greenhouse gas emissions should be reduced, fossil fuels and fossil-fuel-based technologies can, and must, play a role. DOE

N90-15543# Oak Ridge National Lab., TN. Energy Div.
FACTORS THAT MAY INFLUENCE RESPONSES OF THE US TRANSPORTATION SECTOR TO POLICIES FOR REDUCING GREENHOUSE GAS EMISSIONS
EDWARD L. HILLSMAN and FRANK SOUTHWORTH 1990 30 p Presented at the Transportation Research Board Meeting, Washington, DC, Jan. 1990
(Contract DE-AC05-84OR-21400)
(DE90-000704; CONF-900121-3) Avail: NTIS HC A03/MF A01

Transportation vehicle operations in the U.S. contribute 32 percent of the nation's emissions of carbon dioxide, and 7 percent of the world's emissions from energy use. Technical options exist to reduce emissions rates, but policies to reduce emissions must recognize the fragmentation of responsibility for key transportation activities among diverse groups of decision makers, and the need to coordinate their decisionmaking. Policies to increase vehicle fuel efficiency affect decisions by vehicle suppliers, transportation service suppliers, and those who demand transportation services. Policies to shift to alternative transportation fuels affect decisions by these decision makers, by fuel suppliers, and possibly by infrastructure developers as well. Long-term increases projected in the demand for transportation services will offset emission reductions from these policies unless service can be delivered by modes with lower emissions, or unless demand growth can be managed as is now occurring in other sectors of the economy. Additional research is needed to determine the most effective demand management strategies. DOE

N90-16356# Environmental Protection Agency, Washington, DC. Office of Research and Development.
SCIENTIFIC LINKAGES IN GLOBAL CHANGE
PETER R. JUTRO, ROBERT C. WORREST, and ANTHONY C. JANETOS 16 Jun. 1989 18 p Sponsored by Air and Waste Management Association, Pittsburgh, PA
(PB90-112608; EPA/600/D-89/126) Avail: NTIS HC A03/MF A01 CSCL 13/2

In the atmosphere, certain trace gases both promote global warming and deplete the ozone layer. The primary radiatively active trace gases which affect global warming are carbon dioxide, nitrous oxide, chlorofluorocarbons, methane, and tropospheric ozone. In the troposphere, the atmosphere up to 10 miles above the earth's surface, these compounds function as greenhouse gases. Many of these gases also influence the concentration of ozone in the stratosphere, the atmospheric layer located between 10 to 30 miles above the earth's surface. The diffuse layer of ozone in the stratosphere protects life on earth from harmful solar radiation. A reduction of the layer could have very important impacts on the earth's systems. Interactions exist in various ecological processes as well. Physical, chemical, and biological activities of plants and animals are affected directly by global climate change and by increased ultraviolet radiation resulting from depletion of stratospheric ozone. GRA

N90-16359# National Environmental Satellite Service, Washington, DC. Office of Research and Applications.
OPERATIONAL OZONE MONITORING WITH THE GLOBAL OZONE MONITORING RADIOMETER (GOMR)
WALTER G. PLANET, ed. Aug. 1989 33 p
(PB90-114034; NOAA-TM-NESDIS-28) Avail: NTIS HC A03/MF A01 CSCL 13/2

The Global Ozone Monitoring Radiometer (GOMR) is planned for the next series of operational polar-orbiting meteorological satellites. The GOMR is conceived of being composed of two components: a nadir sounder for determining total ozone amounts and a limb sounder for determining vertical stratospheric distributions of temperature, ozone and other trace gases of importance to ozone photochemistry. GRA

N90-16364# Sandia National Labs., Albuquerque, NM. Strategic Technologies Div.
A QUALITATIVE ARCHITECTURE FOR UNDERSTANDING POLICY RESPONSES TO GLOBAL CHANGE
DENNIS ENGI 1989 8 p Presented at the 9th Miami International Congress on Energy and Environment, Miami Beach, FL, 11-13 Dec. 1989
(Contract DE-AC04-76DP-00789)
(DE90-003936; SAND-89-1338C; CONF-891210-2) Avail: NTIS HC A02/MF A01

An architecture is presented which will provide qualitative clarification of the principal cause-and-effect relationships among various policy options and the resulting impacts on anthropogenic greenhouse gas emissions. A fundamental product of analyzing the Global Change issue in the context of this architecture is the conceptual identification and internalization of conventionally external costs. The robust policy portfolios which evolve from this analysis will, by design, recognize the international dimension and be driven by adaptive incrementalism in order to avoid ill-conditioned and/or major, short-term, infrastructural changes to the energy systems. DOE

N90-16366# Los Alamos National Lab., NM.
PROCEEDINGS OF THE CONFERENCE ON TECHNOLOGY-BASED CONFIDENCE BUILDING: ENERGY AND ENVIRONMENT
JOHN C. ALLRED, ed., ROGER C. ECKHARDT, ed., and ARTHUR S. NICHOLS, ed. Nov. 1989 27 p Conference held in Santa Fe, NM, 9-14 Jul. 1989; sponsored by California Univ.
(Contract W-7405-ENG-36)
(DE90-003363; LA-UR-89-3440-EXC; CONF-8907103-EXC)
Avail: NTIS HC A03/MF A01

This document contains excerpts from the proceedings of the conference on, Technology-Based Confidence Building: Energy and the Environment. It contains the agenda for the conference and a document on, Global Warming and Energy Use; a presentation on, From Militarism to Environmentalism: a New Focus of U.S.-Soviet Relations; a workshop on environmental challenges; a summary address on, Science, Technology, and World Affairs; an address entitled, Energy: the Coin of International Understanding; and concluding remarks. DOE

N90-17213 Yale Univ., New Haven, CT.
DISPELLING THE NORTH AMERICAN ACID RAIN CLOUDS: DEVELOPING A FRAMEWORK FOR POLITICAL CONSENSUS THROUGH THE IDENTIFICATION OF ELITE VIEWPOINTS, VOLUMES 1 AND 2 Ph.D. Thesis
NEELOO BHATTI 1988 876 p
Avail: Univ. Microfilms Order No. DA8917143

Distinctive opposing viewpoints regarding the acidic deposition are characterized. In addition, the specific areas of consensus and disagreement among these elite groups were determined. All of these objectives were carried out using the results of the Q-sort technique and interviews with members of the acid rain elite in both Canada and the United States (i.e., politicians, scientists, regulators, environmental/advocacy groups, and industry/utility personnel). Furthermore, as an understanding of the entire acidic deposition phenomenon is necessary for its political resolution, a comprehensive, in-depth review of the scientific, legal, economic, social and political aspects of this issue was conducted. The results of this study revealed the existence of five main viewpoints (with three subgroups in viewpoint I) and indicated that most of the respondents relied more on non-scientific factors than scientific ones in shaping their viewpoints. The results also showed that there was direct opposition only between two of the viewpoints but, overall, the viewpoints were orthogonal to each other. There were also three compromising groups who were positively correlated with all the viewpoints and the opinions of these were used to formulate a general acidic deposition policy program that would be acceptable to the largest number of elites.
Dissert. Abstr.

N90-17217# Institute of Applied Energy, Tokyo (Japan).
PROSPECT OF NEW ENERGY. GLOBAL WARMING (1988)
Feb. 1988 28 p In JAPANESE
(DE90-702486; TIAE-8901) Avail: NTIS (US Sales Only) HC A03/MF A01

New energy has been developed mainly as substitutes for oil. The issue on global warming by carbon dioxide is considered as one of new energy development strategy. Carbon ranges over the atmosphere, the ocean, and woodlands, and there is the great global sized carbon cycle. The emission of carbon dioxide in the air has increased year by year mainly because of the combustion of fossil fuels, and the Earth's temperature has been raised by the greenhouse effect. It is feared that this temperature change affects the farm products and raises the surface of the sea water. Thinkable countermeasures to global warming are to reduce the emission of carbon dioxide, to catch it before or after emitted in the air, and to adapt it as an unavoidable situation. Since the global warming issue is possible to influence human society and nature seriously, it is necessary to be processed with international cooperation in the early states. DOE

N90-17220# Sandia National Labs., Albuquerque, NM. Strategic Technologies Div.
THE POTENTIAL IMPACT OF CONSERVATION, ALTERNATIVE ENERGY SOURCES, AND REDUCED NONENERGY EMISSIONS ON GLOBAL WARMING
EUGENE A. ARONSON and MICHAEL W. EDENBURN Dec. 1989 75 p
(Contract DE-AC04-76DP-00789)
(DE90-004494; SAND-89-1380) Avail: NTIS HC A04/MF A01

Two global energy consumption scenarios and corresponding nonenergy scenarios are examined to determine how each will contribute to the greenhouse effect and global warming. A steady emissions trend scenario assumes only modest energy conservation and little change in the world's energy consumption patterns and nonenergy emissions. A reduced emissions trend scenario assumes significant conservation, switching from a more carbon-intensive energy source mix to a less intensive mix, and reducing nonenergy emissions. Based on the difference between the two scenarios' results, it is concluded that it is possible to reduce global warming by over 50 percent using a combination of conservation and efficiency improvements; increased use of nuclear; geothermal, and solar/renewable energy sources; and reduced nonenergy emissions. DOE

N90-18107# Oak Ridge National Lab., TN. Energy Div.
ENERGY TECHNOLOGY R AND D AND THE GREENHOUSE EFFECT
P. D. FAIRCHILD and W. FULKERSON 1990 11 p Presented at the 3rd International Energy Agency Heat Pump Conference, Tokyo, Japan, 12-15 Mar. 1990
(Contract DE-AC05-84OR-21400)
(DE90-001339; CONF-900334-2) Avail: NTIS HC A03/MF A01

Global warming from rising atmospheric CO2 concentrations is linked to fossil fuel use, which, in turn, is directly linked to energy end-use needs and what technologies we employ to meet those needs. None of the nonfossil options are ready yet to displace fossil fuels on the scale necessary to stop this rise. What do heat pumps have to do with the greenhouse warming effect. First, heat

pumps represent one technology that can be used to increase the efficiency of energy use, which is the best near to mid-term strategy for reducing the rate of greenhouse warming. Also, chlorofluorocarbons (CFCs) used in heat pump, air conditioning, and refrigeration equipment have emerged as potential greenhouse gases. Future heat pump technology development therefore faces a complex set of trade-offs between direct atmospheric effects from CFC substitutes, indirect effects associated with energy efficiency and CO2 emissions, and providing options which can be used in the developing nations. Industrialized nations must recognize that solutions to these global environmental problems require international cooperation and worldwide participation.
DOE

N90-18813# Corvallis Environmental Research Lab., OR.
EFFECTS OF GLOBAL CLIMATE CHANGE ON AGROECOSYSTEMS: SCOPE OF WORK
DONALD L. PHILLIPS Aug. 1989 23 p
(PB90-120023; EPA/600/3-89/076) Avail: NTIS HC A03/MF A01 CSCL 13/2

The U.S. Environmental Protection Agency, Office of Research and Development (ORD), is initiating a Global Climate Change Program to evaluate the potential environmental effects of climate change. The document describes one project, Effects of Global Climate Change on Agroecosystems, which will be administered at the EPA Environmental Research Laboratory-Corvallis as part of the ORD program. The document describes the areas in which research will be undertaken in the project over the next five years. It also presents the scientific questions that must be addressed in order to answer important public policy needs concerning the potential environmental effects of global climate change on agroecosystems and it describes the general research approaches that will be used to answer the scientific questions. GRA

N90-18816# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PAPER ON GEOGRAPHY IN ENVIRONMENTAL MANAGEMENT: RESEARCH AND NEW TECHNIQUES [O PAPEL DA GEOGRAFIA NO GERENCIAMENTO AMBIENTAL: PESQUISA E NOVAS TECNICAS]
EVLYN MARCIA LEAODEMORAESNOVO Jun. 1989 9 p In PORTUGUESE; ENGLISH summary Presented at the 3rd Annual Symposium on Applied Geographic Physics, Nova Friburgo, Brazil, 29 May - 3 Jun. 1989 Submitted for publication
(INPE-4840-PRE/1469) Avail: NTIS HC A02/MF A01

Some ideas about the role of geography within the environmental management are presented. The expertise in dealing with new techniques for collecting and processing data is brought as a fundamental step so geographers can participate in the environmental management process. Among the techniques modeling, remote sensing, and information systems were emphasized. Author

N90-18817# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PHOTOINTERPRETATION WITH INSTRUMENTS FOR EVALUATION OF ENVIRONMENTAL IMPACT: MATA ATLANTICA IN CUBATA
DALTON DEMORISSONVALERIANO and FLAVIO JORGE PONZONI Aug. 1989 19 p In PORTUGUESE; ENGLISH summary Presented at the National Meeting on Remote Sensing Municipal Planning, Campo do Jordao-SP, 22-23 Oct. 1987
(INPE-4910-PRE/1511) Avail: NTIS HC A03/MF A01

In order to study the impact of the atmospheric pollution originating from the Cubatao's industrial plant over the Mata Atlantica (a strip of Tropical Rain Forest formation that stretch along the Brazilian eastern coast) on the slopes of the Serra do Mar (a mountain chain that runs parallel to the southeastern coast), color infrared air photographs (1:25,000) were used to map the vegetation cover and the land use of approximately 240 sq km, covering degraded areas (Mogi river valley) and preserved areas (Quilombo river valley). The analysis of the photographs demonstrated that the degradation of the vegetation structure by the air pollution is done by the selective and progressive elimination of the largest elements, which may, in its most intensive level, reduce the forest into shrubbery. Considering that the Mata Atlantica slowly builds its capacity to preserve slope stability, a long period is foreseen in which the risk of a natural diaster by means of landslides will be a great threat to the region in the rainy seasons. Author

N90-18820# Argonne National Lab., IL. Environmental Research Div.
TROPOSPHERIC CHEMISTRY OF NATURAL HYDROCARBONS AND ENERGY-RELATED POLLUTANTS: BIOSPHERE/CLIMATE FEEDBACKS
J. S. GAFFNEY and N. A. MARLEY Oct. 1989 18 p Presented at the 198th American Chemical Society National Meeting, Miami Beach, FL, 10-15 Sep. 1989
(Contract W-31-109-ENG-38)
(DE90-005643; CONF-890902-23) Avail: NTIS HC A03/MF A01

This paper outlines some of the potential chemical, physical, and biological feedbacks that can occur in the troposphere from energy-related pollutants because of combustion-related activities. A number of examples are presented where biospheric feedbacks are now known or are likely to be important processes affecting the troposphere and stratosphere. Modeling efforts have attempted to simplify or ignore these systems in evaluating a variety of solutions to pollution problems ranging from urban ozone to global climate change. Particular focus is placed upon the potential for short-term solutions to perceived problems on urban or regional scales (e.g., ozone, acid rain) to lead to regional and global scale problems due to unforeseen coupled feedbacks. Modeling studies that do not incorporate the complexity of these systems are likely to yield inaccurate assessments and lead to ineffective pollution abatement strategies. It is strongly suggested that we need to use the models to examine what if scenarios to evaluate possible negative interactions. DOE

N90-18822# Atmospheric and Environmental Research, Inc., Cambridge, MA.
NATURAL AND ANTHROPOGENIC CLIMATE CHANGE
Progress Report, 1 Mar. - 1 Nov. 1989
W.-C. WANG and W. J. GUTOWSKI 31 Oct. 1989 3 p
(Contract DE-FG02-86ER-60422)
(DE90-006488; DOE/ER-60422/5) Avail: NTIS HC A01/MF A01

This report discusses a research program which includes three tasks: General Circulation Model (GCM) intercomparison and improvement, climate data-model statistics, and China project science coordination. DOE

N90-19672# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
REAL TIME ENVIRONMENT MONITORING USING DATA FROM METEOSAT AND NOAA IMAGING SATELLITES
H. A. VANINGENSCHENAU and J. C. VENEMA 5 Oct. 1987 9 p Presented at the SPIE Symposium on Digital Image Processing and Visual Communications Technologies in Meteorology, Cambridge, MA, 27-28 Oct. 1987 Previously announced in IAA as A89-11730 Sponsored by the Food and Agriculture Organization of the United Nations, Rome, Italy and The Netherlands Ministry of Foreign Affairs/International Development Cooperation
(NLR-MP-87070-U; ETN-89-94044; AD-B143052L) Avail: NTIS HC A02/MF A01

An operational remote sensing system which supports environment monitoring using the multi sensor - multi temporal data acquired by the geostationary and polar orbiting weather satellites is described. The information derived from the satellite images are maps on a continental scale with data on the estimated rainfall, the vegetation index (NDVI), and for experimental use, with data on the soil water available for crops. The operational system, called ARTEMIS, meets the information requirements of the FAO monitoring programs in the areas of food and feed security and plant protection. ESA

N90-19673# Pacific Northwest Lab., Richland, WA.
A PRELIMINARY ANALYSIS OF US CO2 EMISSIONS REDUCTION POTENTIAL FROM ENERGY CONSERVATION AND THE SUBSTITUTION OF NATURAL GAS FOR COAL IN THE PERIOD TO 2010
J. A. EDMONDS, W. B. ASHTON, H. C. CHENG, and M. STEINBERG (Brookhaven National Lab., Upton, NY.) Feb. 1989 63 p
(Contract DE-AC06-76RL-01830)
(DOE/NBB-0085; TR045) Avail: NTIS HC A04/MF A01

The U.S. Department of Energy (DOE) Carbon Dioxide Research Division (CDRD) sponsored research to do a preliminary assessment of the technical feasibility and consequences of reducing U.S. CO2 emissions from 1985 levels by 10, 25 or 50 percent by either the year 1995 or 2010. In addition, DOE/CDRD sponsored a day-long roundtable attended by nine experts in the field to discuss this issue. Two methods of CO2 emissions reduction were considered: energy intensity reductions (conservation), and substitution of natural gas for coal. The study did not address the contribution of other energy supply options or the feasibility of pre- or post-combustion CO2 removal. Furthermore, the study made no attempt to explore specific policies that might be employed to achieve technically feasible CO2 emissions reductions. Six assessment tasks were performed. After a reference forecast was developed from NEPP, CO2 emissions reduction targets were established based on 1985 emissions rates. Conservation potential studies were then examined to see what energy and conservation efficiency improvements are feasible at current and anticipated energy technologies and prices. The potential for CO2 emissions reductions through the substitution of natural gas for coal was studied by examining potential natural gas availability, new natural gas electric power generation technologies, and the cost of coal and natural gas as industrial fuels. Author

N90-19674# Oregon State Univ., Corvallis. Global Climate Change Research Team.
SENSITIVITY OF ECOLOGICAL LANDSCAPES AND REGIONS TO GLOBAL CLIMATIC CHANGE
RONALD P. NEILSON, GEORGE A. KING, ROBERT L. DEVELICE, JAMES LENIHAN, DANNY MARKS, JAYNE DOLPH, BILL CAMPBELL, and GAIL GLICK (NSI Technology Services Corp., Corvallis, OR.) Sep. 1989 193 p
(Contract EPA-68-C8-0006)
(PB90-120072; EPA/600/3-89/073) Avail: NTIS HC A09/MF A01 CSCL 13/2

Increasing awareness of the potential impacts from global climatic change has elicited a storm of research planning among all the major federal agencies. One of the primary difficulties confronted in the planning effort is the need to objectively define clear priorities for research dollars. The report is an attempt to contribute to the process of defining those priorities by scientifically defining specific regions, ecological systems and attributes of those systems that might be particularly sensitive to climate change. Two approaches to addressing sensitivity have been defined, intrinsic sensitivity and sensitivity relative to a particular stressor. Intrinsic sensitivity is gauged by past variations in different ecosystems. Extrinsic or stressor relative sensitivity addressed the same question, but from the perspective of a particular stress. GRA

N90-19699# Kernforschungsanlage, Juelich (Germany, F.R.).
ESTIMATION OF THE DISTRIBUTION OF SO2 AND NOX EMISSION IN EUROPE [ABSCHAETZUNG DER VERTEILUNG DER SO2- UND NOX-EMISSION IN EUROPA]
CHRISTIAN HOLZAPFEL *In* Cologne Univ., The EURAD Model: Structure and First Results p 147-152 1989 In GERMAN
Avail: NTIS HC A08/MF A01

To calculate acid precipitations and ozone concentrations it is necessary to know the hourly emission of SO2, NOX, NH3 and CO. The emission is assumed to be proportional to the population, and the people density is constant in a given state. The towns are first taken into account and their geographic coordinates must be calculated and integrated into the model grid. The comparison with the known data and the calculated values shows an underestimation of NO2 emission and an overevaluation of SO2 emission. ESA

N90-19701# Cologne Univ. (Germany, F.R.).
THE EURAD MODEL IN EUROTRAC [DAS EURAD-MODELL IN EUROTRAC]
A. EBEL *In its* The EURAD Model: Structure and First Results p 159-161 1989 In GERMAN
Avail: NTIS HC A08/MF A01

European experiment on Transport and Transformation of Environmentally Relevant Trace Constituents in the Troposphere over Europe (EUROTRAC) is a EUREKA project, whose aim is to examine the tropospheric ozone and its evolution by human activities, the acid rain and some multiphase processes in the atmosphere, and the biospheric-atmospheric effects of emitted pollutants. EURAD (European acid decomposition) is a contribution to EUROTRAC; which is divided into several modules, such as EUMAC (European modeling of atmospheric constituents), whose purpose is the simulation of transport, chemical transformation and deposition of air contaminants in the atmosphere above Europe, the development of the model and its validation. ESA

N90-19704# Oak Ridge National Lab., TN.
PREDICTING EFFECTS OF GLOBAL CLIMATE CHANGE ON RESERVOIR WATER QUALITY AND FISH HABITAT
LISA H. CHANG and STEVEN F. RAILSBACK 1989 6 p Presented at the 1990 American Society of Civil Engineers Water Resources Planning and Management Division Specialty Conference, Fort Worth, TX, 17-20 Apr. 1990
(Contract DE-AC05-84OR-21400)
(DE90-003674; CONF-900483-1) Avail: NTIS HC A02/MF A01

This paper demonstrates the use of general circulation models (GCMs) for assessing global climate change effects on reservoir water quality and illustrates that general conclusions about the effects of increased carbon dioxide (CO2) concentrations on water resources can be made by using GCMs. These conclusions are based on GCM predictions of the climatic effects of doubling CO2 concentrations. We also point out inadequacies in using information from GCM output alone to simulate reservoir water quality effects of climate change. Our investigation used Douglas Lake, a large multipurpose reservoir in eastern Tennessee, as an example. We studied water temperature and dissolved oxygen (DO), important water quality parameters that are expected to respond to a changed climate. Finally, we used the temperature and DO requirements of striped bass as an indicator of biological effects of combined changes in temperature and DO. DOE

N90-19705# Department of Energy, Washington, DC. Atmospheric and Climate Research Div.
ATMOSPHERIC RADIATION MEASUREMENT PROGRAM PLAN
Feb. 1990 19 p
(DE90-006349; DOE/ER-0442) Avail: NTIS HC A03/MF A01

In order to understand energy's role in anthropogenic global climate change, significant reliance is being placed on General Circulation Models (GCMs). A major goal is to foster the development of GCMs capable of predicting the timing and magnitude of greenhouse gas-induced global warming and the regional effects of such warming. The Atmospheric Radiation Measurement (ARM) Program will contribute to the Department of Energy goal by improving the treatment of cloud radiative forcing and feedbacks in GCMs. Two issues will be addressed: the radiation budget and its spectral dependence and the radiative and other properties of clouds. The experimental objective of the ARM Program is to characterize empirically the radiative processes in the earth's atmosphere with improved resolution and accuracy. A key to this characterization is the effective treatment of cloud formation and cloud properties in GCMs. Through this characterization of radiative properties, it will be possible to understand both the forcing and feedback effects. DOE

N90-20504# Department of Energy, Washington, DC. Atmospheric and Climate Research Div.
ATMOSPHERIC RADIATION MEASUREMENT PROGRAM PLAN
Feb. 1990 116 p
(DE90-008108; DOE/ER-0441) Avail: NTIS HC A07/MF A01

In order to understand energy's role in anthropogenic global climate change, significant reliance is being placed on General Circulation Models (GCMs). A major goal of the Department is to foster the development of GCMs capable of predicting the timing and magnitude of greenhouse gas-induced global warming and the regional effects of such warming. DOE research has revealed that cloud radiative feedback is the single most important effect determining the magnitude of possible climate responses to human activity. However, cloud radiative forcing and feedbacks are not understood at the levels needed for reliable climate prediction. The Atmospheric Radiation Measurement (ARM) Program will contribute to the DOE goal by improving the treatment of cloud radiative forcing and feedbacks in GCMs. Two issues will be addressed: the radiation budget and its spectral dependence and the radiative and other properties of clouds. Understanding cloud properties and how to predict them is critical because cloud properties may very well change as climate changes. The experimental objective of the ARM Program is to characterize empirically the radiative processes in the Earth's atmosphere with improved resolution and accuracy. A key to this characterization is the effective treatment of cloud formation and cloud properties in GCMs. Through this characterization of radiative properties, it will be possible to understand both the forcing and feedback effects. GCM modelers will then be able to better identify the best approaches to improved parameterizations of radiative transfer effects. This is expected to greatly improve the accuracy of long-term, GCM predictions and the efficacy of those predictions at the important regional scale, as the research community and DOE attempt to understand the effects of greenhouse gas emissions on the Earth's climate. DOE

N90-20505# Pacific Northwest Lab., Richland, WA.
GLOBAL WARMING: A NORTHWEST PERSPECTIVE
M. J. SCOTT, ed. and C. A. COUNTS, ed. Feb. 1990 103 p Symposium held in Olympia, WA, 9 Feb. 1989; sponsored by Oregon Department of Energy, Pacific Northwest Lab. and Washington State Energy Office
(Contract DE-AC06-76RL-01830)
(DE90-008140; PNL-SA-17905; CONF-8902158-1) Avail: NTIS HC A06/MF A01

The Northwest Power Planning Council convened a symposium on the subject of global climate change (the greenhouse effect) and its potential for affecting the Pacific Northwest. The symposium was organized in response to a need by the Power Council to understand global climate change and its potential impacts on resource planning and fish and wildlife planning for the region, as well as a need to understand national policy developing toward climate change and the Pacific Northwest's role in it. DOE

N90-20507# Department of Energy, Portland, OR.
DRAFT GLOBAL WARMING STUDY
Jan. 1990 35 p
(DE90-008446; DOE/BP-1327) Avail: NTIS HC A03/MF A01

The 1990 Resource Program Global Warming Study examines potential Bonneville Power Administration (BPA) resource alternatives related to the risk of global warming. The study evaluates strategies for reducing net carbon emissions, and identifies the net carbon contribution of certain resource strategies designed to reduce those emissions. Carbon dioxide (CO2) is the greenhouse gas most associated with electricity production. The main purpose of the global warming study is to identify possible courses of action that BPA might take to reduce its contributions to the risk of global warming and to estimate the efficacy and costs of each approach. The principal measure of effectiveness is the reduction in total atmospheric carbon emissions compared to a base case. DOE

N90-20508# California Univ., Berkeley. Lawrence Berkeley Lab. Energy Analysis Program.
CONTROLLING SUMMER HEAT ISLANDS: PROCEEDINGS
KARINA GARBESI, ed., HASHEM AKBARI, ed., and PHIL MARTIEN, ed. Nov. 1989 351 p Proceedings of the Workshop on Saving Energy and Reducing Atmospheric Pollution by Controlling Summer Heat Islands, Berkeley, CA, 23-24 Feb. 1989
(Contract DE-AC03-76SF-00098)
(DE90-008075; LBL-27872; CONF-8902142) Avail: NTIS HC A16/MF A02

A workshop was held on the energy and pollution implications of summertime urban heat islands and the potential to control them. The presentations, papers, and discussions fell into four broad categories: the potential to conserve energy, reduce atmospheric pollution, and slow global warming by reducing summer heat islands; the use of computer models to understand and simulate the heat island phenomenon; measurements of heat islands; and the design and implementation of heat island mitigation strategies. On the afternoon of the second day of the workshop, the participants divided into workgroups. Group 1 discussed research needs to better quantify the effect of heat island mitigation on energy use. Group 2 discussed future research on the characterization and modeling of heat islands. And Group 3 discussed the development of a manual that would present to policy makers the current knowledge of techniques to mitigate heat islands and thereby save energy. DOE

N90-21483# Department of Energy, Washington, DC. Office of Planning and Environment.
A FOSSIL ENERGY PERSPECTIVE ON GLOBAL CLIMATE CHANGE
D. W. SOUTH, N. BHATTI, M. E. FERNAU, J. L. GILLETTE, R. C. HEMPHILL, H. A. HOOTMAN, and D. S. ROTHMAN Jan. 1990 99 p
(DE90-007894; DOE/FE-0164) Avail: NTIS HC A06/MF A01

This report discusses global climate change from a fossil energy power generation perspective. As such, it highlights the substantial uncertainties that underlie the forecasts of greenhouse gas (GHG) emissions, GHG concentrations, and climate change--forecasts that some believe provide the basis for current initiatives to reduce or eliminate fossil fuel use. In addition, this report demonstrates that if it is determined that GHG emissions should be reduced, fossil-fuel-based technologies must play a role in this process. DOE

N90-21487# Pacific Northwest Lab., Richland, WA.
AN EVALUATION OF THE RELATIONSHIP BETWEEN THE PRODUCTION AND USE OF ENERGY AND ATMOSPHERIC METHANE EMISSIONS
DAVID W. BARNS and J. A. EDMONDS Apr. 1990 241 p
(Contract DE-AC06-76OR-01830)
(DE90-007982; DOE/NBB-0088P) Avail: NTIS HC A11/MF A02

The purpose of this document is to examine the role energy plays in the emission of CH4 to the atmosphere. We begin with an overview of the CH4 cycle, briefly discussing the current understanding of sources and sinks for CH4. We then proceed to a detailed discussion of the energy-related sources of CH4 to the atmosphere. These include coal mining, natural gas production and distribution, combustion of traditional biomass, and landfill methane. This examination will then be used to develop estimates of the total global energy-related emissions of CH4. DOE

N90-22152# Los Alamos National Lab., NM. Center for National Security Studies.
PROCEEDINGS OF THE CONFERENCE ON TECHNOLOGY-BASED CONFIDENCE BUILDING: ENERGY AND ENVIRONMENT
JOHN C. ALLRED, ed., ROGER C. ECKHARDT, ed., and ARTHUR S. NICHOLS, ed. Nov. 1989 533 p Conference held in Santa Fe, NM, 9-14 Jul. 1989; sponsored by California Univ.
(CNSS-PAPERS-22) Avail: NTIS HC A23/MF A03

The aim of the conference was to survey programs of international cooperation in pertinent areas of mutual concern to

all nations and to identify new initiatives that could contribute to enhanced international stability, with emphasis on cooperation between the U.S. and the U.S.S.R. Topics addressed include: energy production; nuclear reactor technology; reactor safety; agriculture; global warming; energy use; cooperative ventures; global change; air pollution; scientific exchanges; and geothermal energy technology.

N90-23793# Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
EFFECTS OF AIR TEMPERATURE ON ATMOSPHERIC CO2-PLANT GROWTH RELATIONSHIPS
STEPHEN G. ALLEN, SHERWOOD B. IDSO, BRUCE A. KIMBALL, JEFFREY T. BAKER, L. H. ALLEN, JR., JACKSON R. MAUNEY, JOHN W. RADIN, and MICHAEL G. ANDERSON (Arizona State Univ., Tempe.) Apr. 1990 61 p
(Contract DE-AI01-81ER-60001)
(DE90-010159; DOE/ER-0450T) Avail: NTIS HC A04/MF A01

The carbon dioxide concentration of the earth's atmosphere is increasing and expected to double some time during the middle of the next century. In addition, climate models predict that due to the greenhouse effect, increased atmospheric CO2 may cause a warming of the earth's surface of 1.5 to 4.5 C. The separate effects of atmospheric CO2 concentration and temperature on plant processes has been studied extensively. In general, a doubling of CO2 results in about a one-third increase in productivity of C3 plants, although a wide range of responses have been reported. This report reviews research concerned with the CO2 by temperature interaction effects on plants, with an emphasis on experiments conducted in outdoor, CO2-enriched environments.
DOE

N90-26403# Stockholm Univ. (Sweden). Dept. of Meteorology.
NORDIC SYMPOSIUM ON ATMOSPHERIC CHEMISTRY
HOWARD B. ROSS, ed. Mar. 1990 121 p Symposium held in Stockholm, Sweden, 6-8 Dec. 1989
(CM-78; ISSN-0280-445X; ETN-90-97038) Avail: NTIS HC A06/MF A01

The papers given at the Nordic symposium on atmospheric chemistry are presented. Deposition on the Baltic sea, the study of long range transport and deposition of pollutants, and an atmospheric chemistry trajectory model are discussed. Global tropospheric sulfur simulations, the relative importance of greenhouse gases, and vertical ozone probing are described. The transfer of mercury between the atmosphere and lake or soil surfaces and measurement of turpenes in coniferous forests are described. The formation and kinetics of N2O and the photodissociation of N2O in the stratosphere and mesosphere are discussed. The partitioning of H2SO4 in clouds is described.

N90-26413# Stockholm Univ. (Sweden). Dept. of Meteorology.
RESULTS FROM GLOBAL TROPOSPHERIC SULPHUR SIMULATIONS
JOAKIM LANGNER, HENNING RODHE, and ULF HANSSON *In its* Nordic Symposium on Atmospheric Chemistry 4 p Mar. 1990
Avail: NTIS HC A06/MF A01

The oxidation of gaseous sulfur compounds to form sulfate aerosols is studied. The process is thought to be a major source of Cloud Condensation Nuclei (CCN). Changes in the concentration of CCN are studied in terms of their potential climatic effect. Global 3-D model simulations of the atmospheric stage of the sulfur cycle are presented. Estimates of natural and anthropogenic emissions are used in developing these models. The models are in good agreement (within 15 percent) for individual grid squares where good observations are available (Europe and north eastern U.S.).
ESA

N90-26415# Institutet foer Vatten-Och Luftvaardsforskning, Goeteborg (Sweden).
RESULTS FROM THE IVL TOR STATION AT ROERVIK, SWEDEN. A CONTRIBUTION TO THE EURATRAC SUBPROJECT TOR
ANNE LINDSKOG *In* Stockholm Univ., Nordic Symposium on Atmospheric Chemistry 5 p Mar. 1990 Sponsored by Swedish Environmental Protection Agency
Avail: NTIS HC A06/MF A01

The Tropospheric Ozone Research (TOR) subproject of EUROTRAC is described. EUROTRAC is a joint European environmental project studying the impact of human activities on the troposphere over Europe. Results of measurements of ozone, nonmethane hydrocarbons, C2 to C5, Peroxy acetyl nitrate, H2O2 and standard meteorology at the Rorvik station during 1989 are presented. The techniques used in these measurements are described. Variations in the levels of individual hydrocarbons during two episodes in June and August are analyzed in detail. ESA

N90-26416# Lund Inst. of Tech. (Sweden). Dept. of Physics.
VERTICAL OZONE PROBING WITH LIDAR
H. EDNER, P. RAGNARSON, S. SVANBERG, and EVA WALLINDER *In* Stockholm Univ., Nordic Symposium on Atmospheric Chemistry 4 p Mar. 1990
Avail: NTIS HC A06/MF A01

Lidar as a tool for use in measuring air pollution is discussed. The techniques involved in analyzing the backscattered light for the pulsed laser lidar beam are described. The Tropospheric Environmental Studies by Laser Sounding (TESLAS) project is described. The use of lidar in measuring tropospheric ozone is discussed. An ozone lidar system constructed within the TESLAS project is described. The system is to be used for monitoring ozone up to 5 to 8 km. A more powerful stratospheric system which could be mounted in a movable container is described.
ESA

N90-26418# Lund Univ. (Sweden). Dept. of Nuclear Physics.
CHARACTERIZATION OF BIOGENIC AEROSOL PARTICLES FROM THE AMAZON BASIN DURING DRY AND WET SEASON
PAULO ARTAXO *In* Stockholm Univ., Nordic Symposium on Atmospheric Chemistry 4 p Mar. 1990
Avail: NTIS HC A06/MF A01

The characteristics of gases and aerosol particles in the atmosphere of the Amazon basin are studied. The Amazon Boundary Layer Experiment (ABLE) which is part of the Global Tropospheric Experiment (GTE) is described. The aerosol sampling and analysis techniques used are described. Results of sampling and analysis surveys to date are presented. It is concluded that, considering the vast area of tropical rain forests and the aerosol concentrations recorded, biogenic particles are important in the global aerosol budget, and in the global biogeochemical cycles of various elements. Continuing deforestation of the Amazon basin is predicted to alter the amount of cloud condensation nuclei with possible effects in global weather and climate. ESA

N90-28143# Combustion Engineering Environmental's Environmental Monitoring and Services, Inc., Camarillo, CA.
INVESTIGATION OF THE EFFECTS OF ACID DEPOSITION ON MATERIALS Final Report
R. VIJAYAKUMA, F. MANSFELD, and R. HENRY Oct. 1989 165 p Prepared in cooperation with University of Southern California, Los Angeles Sponsored by California State Air Resources Board, Sacramento, CA
(Contract A4-110-32; A5-137-32)
(PB90-158973; ARB-R-89/422) Avail: NTIS HC A08/MF A01
CSCL 13/2

The objective of the project was to determine damage functions which relate the atmospheric corrosion losses to the concentration of the pollutants which are routinely monitored. The materials investigated in the study were chosen based on the economic importance and included galvanized steel, nickel, aluminum, two types of flat latex exterior housepaint, nylon fabric, polyethylene and concrete. Atmospheric data were provided by ARB's air monitoring network at the three test sites in Southern California. The results from the field sites have been supported by laboratory tests in which corrosion damage was determined. The samples were exposed to SO2, NO2, or O3 and the combinations and to HNO3 aerosol of two different concentrations and flow rates.

Corrosion rates determined by weight loss for galvanized steel, nickel, aluminum and latex paint containing some carbonate extender were higher in the summer than in the winter despite the fact that moisture and primary pollutant levels are higher in the winter. The corrosion rates for galvanized steel which has served as a benchmark material in most atmospheric exposure tests were very low and similar to rates which are usually observed at clean, rural areas. Damage functions were determined by regression of the corrosion rates against the explanatory variables which in the study were O3, NO2, T60, O3xT60, NO2xT60 and O3xNO2 averaged over the exposure. T60 is the time for which the RH exceeded 60 percent. GRA

N90-28146# Environmental Protection Agency, Washington, DC. Office Policy, Planning, and Evaluation.
POLICY OPTIONS FOR STABILIZING GLOBAL CLIMATE. VOLUME 1: CHAPTERS 1-6 Draft Report
DANIEL A. LASHOF, ed. and DENNIS A. TIRPAK, ed. Feb. 1989 408 p
(PB90-182304) Avail: NTIS HC A18/MF A03 CSCL 13/2

A general introduction is provided to the climate change issue and selected previous studies are reviewed. The greenhouse gases, their sources and sinks, chemical properties, current atmospheric concentrations and distributions, and the relation of greenhouse gases to the processes of climatic change are discussed. Once this link is made, those human activities that affect trace-gas emissions and ultimately influence climate change are examined. The scenarios developed to assist in thinking about possible future emissions and climate change are discussed and then sensitivity analyses are presented of the modeling results. A detailed description is given of existing and emerging technologies that should be considered in the formulation of a comprehensive strategy for mitigating global warming. Domestic policy options, and international mechanisms for responding to climate change are discussed. Author

N90-28147# Environmental Protection Agency, Washington, DC. Office of Policy, Planning, and Evaluation.
POLICY OPTIONS FOR STABILIZING GLOBAL CLIMATE. VOLUME 2: CHAPTERS 7-9 Draft Report
DANIEL A. LASHOF, ed. and DENNIS A. TIRPAK, ed. Feb. 1989 457 p
(PB90-182312) Avail: NTIS HC A20/MF A03 CSCL 13/2

Different energy sources, fuels, and substitutes are discussed in different scenarios to either reduce or control the pollution which causes the greenhouse effect therefore changes the climate of the world are discussed. The substitute technologies and other means are described by which greenhouse gas emissions could be reduced relative to the scenarios described. A range of policies that might be used to promote such reductions are described, which address domestic and international issues. The diverse sources and economic activities responsible for greenhouse gas emissions are discussed. The primary means of accomplishing the goal of reducing greenhouse gas emissions is the development and use of technologies that reduce energy requirements (i.e., improve energy efficiency), use less carbon-intensive fuels, or that replace or reduce emissions of other greenhouse gases. In addition to this technological approach, there are also several areas in which management strategies are the means of reducing greenhouse gas emissions, particularly with respect to the buildup of gases resulting from some agricultural practices and forest resources. Author

N90-28149# Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
QUALITY ASSURANCE SUPPORT FOR THE NATIONAL ATMOSPHERIC DEPOSITION PROGRAM AND NATIONAL TRENDS NETWORK MONITORING ACTIVITIES: 1987-1990 Interim Report No. 2
D. S. BIGELOW Feb. 1990 62 p
(Contract EPA-CR813910-03)
(PB90-187162; EPA/600/3-90/018) Avail: NTIS HC A04/MF A01 CSCL 13/2

The quality assurance activities of the National Atmospheric Deposition Program/National Trends Network (NADP/NTN) Quality Assurance Manager from mid-1988 through mid-1989 are summarized. Some accomplishments are presented and recommendations for the networks are made. The progress being made by the NADP/NTN monitoring program in completing documentation of standard operating procedures, responding to field operation and siting deficiencies, and discussions of data quality issues relating to the handling of TRACE samples and the quality coding of daily rain amounts are outlined. An evaluation is given of a second laboratory's participation in the network and reports on a preliminary evaluation of Nipher-shielded Belfort rain gauge performance in the network. Recommendations emphasize the continued support of the quality assurance manager's role in coordinating quality assurance activities and the need for more support for the gathering and interpretation of quality assurance data. GRA

N90-28150# Princeton Univ., NJ. Center for Energy and Environmental Studies.
ROLE OF GRID-BASED, REACTIVE AIR QUALITY MODELING IN POLICY ANALYSIS: PERSPECTIVES AND IMPLICATIONS, AS DRAWN FROM A CASE STUDY Final Report
P. M. ROTH, C. E. BLANCHARD, and S. D. REYNOLDS Mar. 1990 115 p Prepared in cooperation with Systems Applications, Inc., San Rafael, CA
(Contract EPA-68-01-6849)
(PB90-187204; EPA/600/3-89/082) Avail: NTIS HC A06/MF A01 CSCL 13/2

A primary objective is to improve the understanding of the role of performance quality in determining a model's acceptability and usefulness to the policy maker, and thus to aid in developing soundly-based expectations of the modeling process. The vehicle for pursuing this objective is examining the historical evolution of the Urban Airshed Model (UAM), a grid-based photochemical model whose basic formulation is similar to the Regional Acid Deposition Model, and its application to policy analysis in the South Coast Air Basin of California. A derivative objective is to draw implications from the findings to aid in appraising the merits of future pursuits, notably the mounting of comprehensive field programs to support the evaluation of regional acid deposition models. The UAM is described, and its predictive capability is examined through scrutiny of historical performance statistics. Its degree of acceptance in the scientific and regulatory communities, based on information and viewpoints solicited through questionnaires and interviews, is assessed. The influence on the policy-making community of the UAM studies and, based on these findings, attempts to develop a perspective on the expectations of current regional acid deposition models are discussed. GRA

N90-28153# Research Triangle Inst., Research Triangle Park, NC.
LABORATORY AND FIELD EVALUATIONS OF EXTRASENSITIVE SULFUR DIOXIDE AND NITROGEN DIOXIDE ANALYZERS FOR ACID DEPOSITION MONITORING Report, 1 Jan. - 10 Aug. 1988
E. E. RICHMAN, A. H. GREEN, R. S. WRIGHT, and J. E. SICKLES May 1989 127 p
(Contract EPA-68-02-4550)
(PB90-201062; EPA/600/3-90/034) Avail: NTIS HC A07/MF A01 CSCL 13/2

Studies of environmental acid deposition require monitoring of very low levels of several atmospheric pollutants. Various passive and active samplers were used to collect integrated atmospheric samples for such studies. Continuous analyzers offer an advantage because of their capability to provide more detailed information on the diurnal concentration patterns of the pollutants of interest. The U.S. Environmental Protection Agency (EPA) acquired two continuous NO2 analyzer models (CSI 1600 and Scintrex LMA 3) and one SO2 analyzer model (TECO 43S) with sufficient sensitivity to be potentially useful in studies of acid deposition. In the laboratory evaluation, performance parameters such as precision, limit of detection and interferences were quantitated. In the 31-day

field evaluation, zero and span factor drafts and precision were quantitated. The results of the laboratory and field evaluations are given. Although EPA has not established performance specifications for extrasensitive analyzers, the results of the laboratory and field evaluations suggest that the analyzers, generally, will perform in an acceptable fashion for the intended application. Nevertheless, several specific areas needing improvement were uncovered in the evaluations. GRA

N90-28160# Maryland Dept. of Natural Resources, Annapolis. Chesapeake Bay Research and Monitoring Div.
ACID DEPOSITION IN MARYLAND: SUMMARY OF RESULTS THROUGH 1989 Final Report
J. DEMURO, M. BOWMAN, C. MAXWELL, D. ASANTE-DUAH, and S. MEYERS Jun. 1990 111 p Prepared in cooperation with Environmental Resources Management, Inc., Annapolis, MD
(PB90-229782; CBRM-AD-90-4) Avail: NTIS HC A06/MF A01 CSCL 13/2

The Chesapeake Bay Research and Monitoring Program coordinates Maryland's acid deposition research and reports research results annually. Evaluated here are several major topic areas including transport and chemistry of acid deposition, its potential impacts on the State's streams and fish, possible impacts on terrestrial resources such as crops and forests, the ability of energy conservation programs to reduce emissions of acid-forming pollutants, and migration techniques for neutralizing acid waters. GRA

N90-28909# Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
NATIONAL AIR QUALITY AND EMISSIONS TRENDS REPORT, 1988
T. C. CURRAN, R. FAORO, T. FITZ-SIMONS, N. FRANK, and W. FREAS Mar. 1990 153 p
(PB90-200114; EPA/450/4-90/002) Avail: NTIS HC A08/MF A01 CSCL 13/2

National and regional trends in air quality from 1979 through 1988 for total suspended particulate, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone and lead are presented. Air pollution trends were also examined for the 5-year period (1984 to 1988). Both national and regional trends in each of these pollutants are examined. National air quality trends are also presented for both the National Air Monitoring Sites (NAMS) and other site categories. In addition to ambient air quality, trends are also presented for annual nationwide emissions. The emissions are estimated using the best available engineering calculations; the ambient levels presented are averages of direct measurements. Also included is a section on levels in Metropolitan Statistical Areas (MSAs). Its purpose is to provide interested members of the air pollution control community, the private sector and the general public with greatly simplified air pollution information. Air quality statistics are presented for each of the pollutants for all MSAs with data in 1988. GRA

N90-28917# East Anglia Univ., Norwich (England).
CHASING A SPECTER: RISK MANAGEMENT FOR GLOBAL ENVIRONMENTAL CHANGE
TIMOTHY ORIORDAN and STEVE RAYNER (Oak Ridge National Lab., TN.) Oct. 1989 19 p Presented at the International Workshop on Understanding Global Environmental Change, Worcester, 11-13 Oct. 1989
(Contract DE-AC05-84OR-21400)
(DE90-014455; CONF-8910434-1) Avail: NTIS HC A03/MF A01

Global environmental change is both a concept and a process that changes in meaning with scientific discovery, public concern, and political responsiveness. It is the relationship between the problems as perceived and the various institutions that help shape and adapt to such problems that defines global environmental change. There is a kind of race between scientific detective work and political adjustment to lessen the likely impacts that predictive science is trying to verify. Risk analysis, because of its capacity to recognize this relationship in many spheres of problem identification, can contribute to the political debate, mostly by proposing institutional redesign of the relationship among scientific research, public entry, and experimental readjustments to consensus formation and international action. This paper discusses the factors involved in global environmental change, the risk management involved, the holistic interpretation, and the environmental impacts. DOE

N90-28918# Argonne National Lab., IL.
RESPONDING TO THE THREAT OF GLOBAL WARMING: OPTIONS FOR THE PACIFIC AND ASIA
DAVID G. STREETS, ed. and TOUFIC A. SIDDIQI, ed. 1989 526 p Presented at the Responding To the Threat of Global Warming: Options for the Pacific and Asia, Honolulu, HI, 21-27 Jun. 1989
(Contract W-31-109-ENG-38)
(DE90-014756; ANL/EAIS/TM-17; CONF-8906244) Avail: NTIS HC A23/MF A03

The primary goal of the workshop was to explore the options that the countries of the Pacific and Asia have for dealing with the threat of global warming. The countries of the Pacific and Asia must address a variety of issues related to global warming, ranging from determining the advisability of reducing greenhouse-gas emissions to assessing the vulnerability of various communities to the consequences of climate change only adds to the many other important health and socioeconomic problems they must face. The goal of this workshop was to bring together policy makers, scientists, and analysts who are concerned about the issue of climate change in this region so they could begin to develop information that will help decision makers formulate rational policy alternatives. Four principal areas of discussion: the current state of knowledge about global climate change and its likely consequences; energy policy options for slowing the expected growth in emissions of greenhouse gases; mitigation measures to cope with the impacts (including impacts related to agriculture and sea-level rise), should they occur, and research needs to assist decision makers in the Pacific and Asia. This volume compiles the proceedings of the workshop. DOE

N90-28921# State Dept., Washington, DC. Bureau of Oceans and International Environmental and Scientific Affairs.
PUERTO RICO WORKSHOP ON LAND-BASED SOURCES OF MARINE POLLUTION IN THE WIDER CARIBBEAN REGION
Apr. 1990 34 p Workshop held in San Juan, Puerto Rico, 7-9 Aug. 1989 Sponsored by National Park Service, Washington, DC; Agency for International Development, Washington, DC; EPA, Washington, DC; and NOAA, Rockville, MD
(PB90-184094) Avail: NTIS HC A03/MF A01 CSCL 13/2

The participants in the conference met August 7 to 9, 1989, in San Juan, Puerto Rico. The participants divided the report into four major sections, each succeeding section relying for inputs from the preceding sections. They are: inventory of land-based sources of marine pollution. The inventory, divided into point sources and non-point sources of pollutants, establishes the baseline data for dealing with marine pollution, and the impact of land-based sources of marine pollution. The extent of the impact of pollutants on the ecological and economic life dependent on the marine environment calls for scientific analyses involving the nature of the polluting substances as well as that of the receiving marine areas, development of tropical water quality and effluent standards. Tropical water quality criteria and standards provide essential analytical links between the use of marine waters and the control of marine pollution, and marine pollution control strategy. The means for managing land-based sources of marine pollution can be divided into utilizing marine water quality standards, effluent standards, environmental planning, and best management practices. The authors dealt with only man-made pollution, which is distinct from natural pollution such as oil seepage through ancient fissures in the seabed. GRA

N90-28923# Atmospheric and Environmental Research, Inc., Cambridge, MA.
NATURAL AND ANTHROPOGENIC CLIMATE CHANGE Annual Technical Progress Report, 1 Sep. 1989 - 15 May 1990

W. J. GUTOWSKI, S. A. CLOUGH, G. MOLNAR, M. IACONO, and W.-C. WANG (State Univ. of New York, Albany.) Jul. 1990 9 p
(Contract DE-FG02-86ER-60485)
(DE90-015528; DOE/ER-60485/3) Avail: NTIS HC A02/MF A01

This report covers work on grant FG02-86ER60485 and consists of two parts: progress for the period 9/1/89 to 5/15/90 and the plan for the remaining period 5/16/90 to 8/31/90. The project includes two tasks: atmospheric radiation and improvement of climate models to evaluate the climatic effects of radiation changes. DOE

N90-29704# Committee on Commerce, Science, and Transportation (U.S. Senate).
GLOBAL CLIMATE CHANGE: SEEKING A GLOBAL CONSENSUS
Washington GPO 1990 60 p Hearing before the Committee on Commerce, Science, and Transportation, 101st Congress, 2d Session, 14 Jun. 1990
(S-HRG-101-842; GPO-33-588) Avail: Committee on Commerce, Science, and Transportation, Senate, Washington, DC 20510 HC free; also available SOD HC $2.00 as 552-070-08819-5

The science of global change was discussed in a hearing before the Senate Committee on Commerce, Science, and Transportation. Reports from three Working Groups of the Intergovernmental Panel on Climate Change (IPCC) were presented. IPCC was established to promote the cooperation of more than 50 countries in combatting global climate changes with policies and action. Working Group 1 tried to differentiate what was certain, from what could be calculated with confidence, from what was less certain. They concluded that predictive capabilities and models need to be improved, and that sources of six of the greenhouse gases need to be better understood. Working Group 2 tried to evaluate the potential implications of climate change - both the environmental implications and the social and economic implications. It was concluded that there could be an unwelcome cost to maintaining the current level of food production, a decrease in animal and plant species, problems with water resources, flooding, soil erosion, landslides, and major health problems. Working Group 2 indicated an inability to analyze the likely social-economic impacts of climate change because available information is too diverse and controversial. However, issues for further debate were identified. Working Group 3, chaired by the U.S., tried to identify and consider strategies; i.e., potential options for limiting or adapting to climate change if such action is deemed necessary in the light of scientific evidence. This group has four subgroups: (1) Energy and Industry; (2) Agriculture and Forestry; (3) Coastal Zone Management; and (4) Resource Use and Management. The first two subgroups considered ways to limit greenhouse gas emissions; the other two considered measures for adapting to the impacts of climate change, e.g., sea level rise. Working Group 3 indicated a need for immediate adoption of economically feasible and environmentally justified options, including improved energy efficiency, cleaner energy sources, changes in agricultural land use, and reforestation, as well as widespread information dissemination, tailored to the socially, economically, and culturally diverse nations in IPCC. Senator Albert Gore, Jr., who presided over the hearing, expressed his disappointment in the failure of Working Group 3 to list specific goals or actions that might solve the problems, but noted that the U.S. representatives had, no doubt, acted in accord with the Administration. J.P.S.

N90-29706# Environmental Protection Agency, Rockville, MD. Air and Energy Engineering Research Lab.
SUCCESS OF EPA'S STRATOSPHERIC OZONE ENGINEERING RESEARCH
WILLIAM J. RHODES and PAUL S. SHAPIRO (Environmental Protection Agency, Washington, DC.) 1990 12 p Presented at the 83rd Annual Meeting of the Air and Waste Management Association, Pittsburgh, PA, 24-29 Jun. 1990
(PB90-246265; EPA/600/D-90/084) Avail: NTIS HC A03/MF A01 CSCL 13/2

Recent successes and work in progress on EPA's stratospheric ozone engineering research are summarized. The Montreal Protocol and U.S. regulations implementing the Protocol necessitate that engineering solutions be found and implemented to avoid the use of certain chlorofluorocarbons (CFCs) and halons. CFCs and halons are used for solvents, refrigerants, aerosol propellants, foams, and fire protection. Nearly all EPA activities in this program involve pollution prevention as the first alternative. This includes alternative processes, alternative chemicals, alternative means of accomplishing the desired service, and recycling. Industry cooperation is needed in order to take advantage of industry's expertise, to get industry to buy into the solution, to conserve valuable time and resources, and to implement results rapidly. Since the problem will be solved only through international efforts, the U.S is also placing high priority on technical assistance to developing countries. GRA

N90-29708# Lawrence Livermore National Lab., CA. Environmental Sciences Div.
EFFECTS OF INCREASED CO2 ON FOREST RESPONSE
JOSEPH H. SHINN May 1990 10 p Presented at the 83d Annual Meeting and Exhibition of the Air and Waste Management Association, Pittsburgh, PA, 24-29 Jun. 1990
(Contract W-7405-ENG-48)
(DE90-015406; UCRL-JC-103410; CONF-900676-10) Avail: NTIS HC A02/MF A01

This document discusses our forests current response to the stress elevated CO2. The response to direct effects and to increased variability of precipitation and temperature may be more important than the response to change in average climate. We need to be prepared for the potential effects by formulating forest management plans and government policies based on enlightened risk assessments and adequate research. DOE

N90-29712# Oak Ridge National Lab., TN.
SAMTRACK: A SAMPLE TRACKING SYSTEM FOR ENVIRONMENTAL MONITORING
B. M. HORWEDEL 1990 9 p Presented at the Data Analysis and Interpretation for Environmental Surveillance Conference, Lexington, KY, 5-7 Feb. 1990
(Contract DE-AC05-84OR-21400)
(DE90-016026; CONF-9002111-2) Avail: NTIS HC A02/MF A01

The Environmental Monitoring and Compliance Section (EMC) is responsible for the development and implementation of an environmental program to ensure compliance with all Federal, state, and Department of Energy requirements for the prevention, control, and abatement of environmental pollution; monitor the adequacy of containment and effluent controls; and assess impacts of releases from ORNL facilities on the environment. Each month over 1000 samples of air, water, animals, and vegetation are collected and analyzed for contamination. A sample tracking system (SamTrack) was developed to automate the bookkeeping and report generation procedures required by EMC. SamTrack makes it possible for EMC to monitor individual samples from the time of submission to Analytical Chemistry Division (ACD) through the electronic transfer of analytical results. SamTrack dynamically maintains a sample status database. At anytime a variety of reports can be generated showing the status of samples being processed. Three basic reports reflect the status of the entire sample database: samples that have been submitted for analysis; samples that have completed analysis; and, samples with incomplete analysis. This paper presents the needs for a sample tracking system, how SamTrack addresses those needs, and future modifications that would improve the implementation of SamTrack. DOE

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GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

A90-10116
NOAA SATELLITE PROGRAMS IN SUPPORT OF A GLOBAL CHANGE PROGRAM
GEORGE OHRING (NOAA, National Environmental Satellite Data and Information Service, Washington, DC) (COSPAR, IAMAP, Scientific Committee on Oceanic Research, et al., Plenary Meeting, 27th, Symposium 1 and Topical Meeting on the Remote Sensing of Atmosphere and Oceans, Espoo, Finland, July 18-29, 1988) Advances in Space Research (ISSN 0273-1177), vol. 9, no. 7, 1989, p. 295-299. refs
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Although designed primarily for weather observations, NOAA's operational polar satellites have the potential to provide considerable information on global change. The weather/climate products routinely produced from these satellites and relevant to global change are discussed. They include: ocean surface temperatures, snow cover area for Europe and Eurasia, Arctic and Antarctic sea ice area, global vegetation index, narrow-band estimates of the earth's radiation budget, atmospheric ozone, and stratospheric temperatures. Global and hemispheric time series of these variables as determined from satellites are presented. Algorithms for new products - aerosol optical depth, surface radiation budget, land surface temperature, cloud amounts and heights, precipitation, and cloud liquid water - are being developed. NOAA's plans for the NOAA K,L,M, satellite series and the Polar Platform are discussed. Author

A90-16408* California Univ., Berkeley.
NITROGEN OXIDES FROM HIGH-ALTITUDE AIRCRAFT - AN UPDATE OF POTENTIAL EFFECTS ON OZONE
HAROLD S. JOHNSTON (California, University, Berkeley), DOUGLAS E. KINNISON, and DONALD J. WUEBBLES (Lawrence Livermore National Laboratory, Livermore, CA) Journal of Geophysical Research (ISSN 0148-0227), vol. 94, Nov. 20, 1989, p. 16351-16363. Research supported by NASA. refs
(Contract DE-AC03-76SF-00098; W-7405-ENG-48)
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In the study of fuel consumption rate by stratospheric aircraft, the range of nitric oxide injection is interpreted as an eightfold range of emission index (5-40) with both the one- and the two-dimensional models. Possible effects of future aircraft NO(x) emissions on stratospheric ozone are considered for a broad range in magnitude, altitude, and latitude of the assumed NO(x) emissions. Results of the sensitivity studies using both models are discussed. Large ozone reductions are found to be outside the expected range of validity of these models and are to be anticipated if there should be a large fleet of stratospheric aircraft with NO(x) emission characteristics of current commercial aircraft. Under the test conditions, a global ozone reduction of about 9 percent is estimated for a jet engine emission index of 15 in both models. If engines are redesigned to reduce the emission index to the NASA goal of 5, global average ozone reductions are between 2 and 3 percent, and those of the Northern Hemisphere are about 4 percent. The effects of stratospheric aircraft on ozone could be further reduced through operation at lower altitudes, reduction of aircraft, and efficient fuel consumption. C.E.

A90-16412*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York, NY.
GREENHOUSE EFFECT OF CHLOROFLUOROCARBONS AND OTHER TRACE GASES
JAMES HANSEN, ANDREW LACIS, and MICHAEL PRATHER (NASA, Goddard Institute for Space Studies, New York) Journal of Geophysical Research (ISSN 0148-0227), vol. 94, Nov. 20, 1989, p. 16417-16421. refs

A comparison is made of the radiative (greenhouse) forcing of the climate system due to changes of atmospheric chlorofluorocarbons and other trace gases. It is found that CFCs, defined to include chlorofluorocarbons, chlorocarbons, and fluorocarbons, now provide about one-quater of current annual increases in anthropogenic greenhouse climate forcing. If the growth rates of CFC production in the early 1970s had continued to the present, current annual growth of climate forcing due to CFCs would exceed that due to CO2. Author

A90-17051
STRATOSPHERIC OZONE - A PRESENT-DAY PROBLEM (REVIEW) [STRATOSFERNYI OZON - PROBLEMA SOVREMENNOSTI /OBZOR/]
S. I. AVDIUSHIN and A. D. DANILOV (Institut Prikladnoi Geofiziki, Moscow, USSR) Geomagnetizm i Aeronomiia (ISSN 0016-7940), vol. 29, Sept.-Oct. 1989, p. 705-717. In Russian. refs
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The paper presents a survey of recent published works on two aspects of the stratospheric-ozone problem: (1) the search for trends in total ozone content (TOC) on the global scale and (2) the springtime reduction of ozone content over the Antarctic. It is noted that, even though there has definitely been a reduction in the TOC over the past decade (by several percent), there is not enough evidence to conclude that this reduction is due to anthropogenic activity. Other processes, such as changes in the solar short-wavelength radiation in the 11-year cycle, could also have produced the observed reduction. B.J.

A90-18977
A TEN-YEAR DECREASE IN THE ATMOSPHERIC HELIUM ISOTOPE RATIO POSSIBLY CAUSED BY HUMAN ACTIVITY
YUJI SANO, HIROSHI WAKITA, YOSHIHIRO MAKIDE, and TAKESHI TOMINAGA (Tokyo, University, Japan) Geophysical Research Letters (ISSN 0094-8276), vol. 16, Dec. 1989, p. 1371-1374. refs
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The isotope ratio of terrestrial air helium is believed to be constant on a global scale since the mixing time for the atmosphere is significantly shorter than the residence time for helium. Recently, the He-3/He-4 ratio at Ueno Park, central Tokyo, Japan, was found to be significantly lower than previously measured values. Reported here is a change in the atmospheric helium isotope ratio from 1.362 x 10 to the -6th in December 1977 to 1.339 x 10 to the -6th in September 1988 or a decrease of about 10 to the -9th/year. Although this change could be due to local/nonglobal effects, minor changes in the atmospheric flux balance for helium or experimental artifacts, the observations are also consistent with a significant influx of a low He-3/He-4 ratio source to the atmosphere. The magnitude of the flux, 0.48-2.9 x 10 to the 16th cu cm STP He/year, is compatible with estimates of the anthropogenic release of crustal helium from gas and oil production from the solid earth. Because of the inert chemistry of helium, a quantification of this change may provide a marker against which to calibrate the absolute flux and retention of anthropogenic CO2 in the atmosphere. Author

A90-18991* National Center for Atmospheric Research, Boulder, CO.
HOW WILL CHANGES IN CARBON DIOXIDE AND METHANE MODIFY THE MEAN STRUCTURE OF THE MESOSPHERE AND THERMOSPHERE?
R. G. ROBLE (High Altitude Observatory, Boulder, CO) and R. E. DICKINSON (National Center for Atmospheric Research, Boulder, CO) Geophysical Research Letters (ISSN 0094-8276), vol. 16, Dec. 1989, p. 1441-1444. refs
(Contract NASA ORDER W-16320)
Copyright

A global average model of the coupled mesosphere, thermosphere, and ionosphere is used to examine the effect of trace gas variations on the overall structure of these regions. In

particular, the variations caused by CO2 and CH4 doublings and halvings from present day mixing ratios are presented. The results indicate that the mesosphere and thermosphere temperatures will cool by about 10 K and 50 K, respectively, as the CO2 and CH4 mixing ratios are doubled. These regions are heated by similar amounts when the trace gas mixing ratios are halved. Compositional redistributions also occur in association with changes in the temperature profile. The results show that global change will occur in the upper atmosphere and ionosphere as well as in the lower atmosphere during the 21st century. Author

A90-21501 Istituto Nazionale di Geofisica, Rome (Italy).
EFFECTS OF LATERAL VISCOSITY VARIATIONS ON POSTGLACIAL REBOUND - IMPLICATIONS FOR RECENT SEA-LEVEL TRENDS
PAOLO GASPERINI (Istituto Nazionale di Geofisica, Rome, Italy), DAVID A. YUEN (Minnesota, University, Minneapolis), and ROBERTO SABADINI (Bologna, Universita, Italy) Geophysical Research Letters (ISSN 0094-8276), vol. 17, Jan. 1990, p. 5-8. Research supported by the Agenzia Spaziale Italiana and NASA. refs
Copyright

Global sea-level changes have been occurring since the last Pleistocene deglaciation. Recently the contribution of current postglacial rebound to local sea-level variations has been removed by means of a radially stratified earth model in order to assess the amount of sea-level rise due to recent climatic changes. The effects of lateral variations in the viscosity structure on the postglacial uplift rates along the continental margins are studied. Finite-element calculations in cylindrical geometry show that the spread in the cumulative vertical displacement may be affected by 20 percent in the presence of lateral rheological contrasts. But the vertical rates of deformation can attain differences of up to 50 percent for the different models. Horizontal deformation rates along continental margins are much more affected by the lateral variations in viscosity and can be used in the future as constraints on mantle rheology. Author

A90-24516
COHERENCE ESTABLISHED BETWEEN ATMOSPHERIC CARBON DIOXIDE AND GLOBAL TEMPERATURE
CYNTHIA KUO, CRAIG LINDBERG, and DAVID J. THOMSON (AT&T Bell Laboratories, Murray Hill, NJ) Nature (ISSN 0028-0836), vol. 343, Feb. 22, 1990, p. 709-714. refs
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The hypothesis that the increase in atmospheric CO2 is related to observable changes in the climate is tested using modern methods of time-series analysis. The results confirm that average global temperature is increasing and that temperature and atmospheric CO2 are significantly correlated over the past 30 years. Changes in CO2 content lag those in temperature by five months. C.D.

A90-37808
CURRENT DATA ON VARIATIONS OF THE OZONE LAYER INDUCED BY ANTHROPOGENIC FACTORS AND THE DEVELOPMENT OF SUBSTITUTES FOR CHLOROFLUOROCARBONS AND HALONS [SOVREMENNYE DANNYE OB IZMENENII SLOIA OZONA POD DEISTVIEM ANTROPOGENNYKH FAKTOROV I RAZRABOTKA ZAMENITELEI KHLORFTORUGLERODOV I GALONOV]
V. M. ZAKHAROV and A. A. CHERNIKOV (Tsentral'naia Aerologicheskaia Observatoriia, Dolgoprudny, USSR) Meteorologiia i Gidrologiia (ISSN 0130-2906), Jan. 1990, p. 116-120. In Russian.
Copyright

A90-40235 World Meteorological Organization, Geneva (Switzerland).
A STATISTICAL TREND ANALYSIS OF REVISED DOBSON TOTAL OZONE DATA OVER THE NORTHERN HEMISPHERE
R. BOJKOV (World Meteorological Organization, Geneva, Switzerland), L. BISHOP, W. J. HILL (Allied-Signal, Inc., Buffalo, NY), G. C. REINSEL (Wisconsin, University, Madison), and G. C. TIAO (Chicago, University, IL) Journal of Geophysical Research (ISSN 0148-0227), vol. 95, June 20, 1990, p. 9785-9807. Research supported by the Chemical Manufacturers Association and NASA. refs
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Results are reported from a statistical trend analysis of total-ozone data obtained at 29 Dobson stations located between 19 and 64 deg N during the period 1958-1986; only data critically revised as described by Bojkov (1988) are included. The procedures employed are explained, and the results are presented in extensive tables and graphs and characterized in detail. For winter months, the ozone trends at latitudes 35, 45, and 55 deg N are found to be -1.2, -2.1, and -3.0 percent per decade, respectively. The summer values are about -0.6 percent per decade at all latitudes, and the year-round overall average trend is -0.84 + or - 0.82 percent per decade. Also discussed are regional variations in the data and the results of sensitivity studies. T.K.

A90-40237* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
PERTURBATIONS TO TROPOSPHERIC OXIDANTS, 1985-2035. I - CALCULATIONS OF OZONE AND OH IN CHEMICALLY COHERENT REGIONS
ANNE M. THOMPSON, RICHARD W. STEWART (NASA, Goddard Space Flight Center, Greenbelt, MD), and MARY ANN HUNTLEY (Applied Research Corp., Landover, MD) Journal of Geophysical Research (ISSN 0148-0227), vol. 95, June 20, 1990, p. 9829-9844. Research supported by EPA. refs
Copyright

A one-dimensional model based on the sensitivity coefficients of Thompson (1990) is used to calculate regional changes in tropospheric O3 and OH due to specified global or regional changes in CH4 and CO emissions over the period 1985-2035. The methods applied are explained, and the results are presented in extensive tables and graphs and characterized in detail. A 10-15-percent increase in global tropospheric O3 and a 10-15-percent decrease in OH are predicted for both (1) global scenarios with continuing increases in CH4 and CO and (2) regional scenarios where emissions are limited in some regions but not in others; significant regional variation in O3 is predicted for (2). If depletion of O3 in the stratosphere and global warming are introduced into (1) or (2), however, they nearly cancel out the tropospheric O3 increases and OH decreases. T.K.

A90-40244* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York, NY.
RADIATIVE FORCING OF CLIMATE BY CHANGES IN THE VERTICAL DISTRIBUTION OF OZONE
ANDREW A. LACIS (NASA, Goddard Institute for Space Studies, New York), DONALD J. WUEBBLES (Lawrence Livermore National Laboratory, Livermore, CA), and JENNIFER A. LOGAN (Harvard University, Cambridge, MA) Journal of Geophysical Research (ISSN 0148-0227), vol. 95, June 20, 1990, p. 9971-9981. refs (Contract EPA-R-812962-01-0; EPA-R-814535-01-0; NAG5-719; W-7405-ENG-48)
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Results from a one-dimensional radiative-convective equilibrium model (similar to that of Lacis et al., 1981) of surface-temperature changes induced by changes in the vertical distribution of O3 in the atmosphere are parameterized and applied to measurement data for the northern midlatitudes during the 1970s. The construction of the model is outlined, and the results are presented in tables and graphs and discussed in detail. It is found that decreases in O3 in the lower stratosphere in the 1970s caused atmospheric cooling greater than that due to CO2 (thus possibly obscuring the CO2 greenhouse effect) and surface cooling which outweighed the warming effect of increased O3 in the troposphere. The net surface cooling is shown to be equal to about half of the estimated CO2 warming effect for the period. T.K.

A90-43224
RECENT INCREASE IN NITRATE CONCENTRATION OF ANTARCTIC SNOW
PAUL A. MAYEWSKI (New Hampshire, University, Durham) and MICHEL R. LEGRAND (CNRS, Laboratoire de Glaciologie et Geophysique de l'Environnement, Saint-Martin-D'Heres, France) Nature (ISSN 0028-0836), vol. 346, July 19, 1990, p. 258-260. Research supported by NSF and CNRS. refs
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Trends in nitrate time series deduced from ice cores from low-accumulation sites such as Dome C and Vostok in Antarctica are reported. Increases in the concentration of the spring maximum in nitrate are found in the South Pole record for the past few years and may result from denitrification of polar stratospheric clouds in the lower stratosphere and may hence be connected with the Antarctic ozone 'hole'. C.D.

A90-45803* New York Univ., New York.
CARBON DIOXIDE EMISSIONS FROM DECCAN VOLCANISM AND A K/T BOUNDARY GREENHOUSE EFFECT
KEN CALDEIRA (New York University, NY) and MICHAEL R. RAMPINO (NASA, Goddard Institute for Space Studies; New York University, NY) Geophysical Research Letters (ISSN 0094-8276), vol. 17, Aug. 1990, p. 1299-1302. Research supported by Columbia University. refs
(Contract NGT-50470; NAGW-1697)
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A greenhouse warming caused by increased emissions of carbon dioxide from the Deccan Traps volcanism has been suggested as the cause of the terminal Cretaceous extinctions on land and in the sea. Total eruptive and noneruptive CO2 output by the Deccan eruptions (from 6 to 20 x 10 to the 16th moles) over a period of several hundred thousand years is estimated based on best estimates of the CO2 weight fraction of the original basalts and basaltic melts, the fraction of CO2 degassed, and the volume of the Deccan Traps eruptions. Results of a model designed to estimate the effects of increased CO2 on climate and ocean chemistry suggest that increases in atmospheric pCO2 due to Deccan Traps CO2 emissions would have been less than 75 ppm, leading to a predicted global warming of less than 1 C over several hundred thousand years. It is concluded that the direct climate effects of CO2 emissions from the Deccan eruptions would have been too weak to be an important factor in the end-Cretaceous mass extinctions. Author

A90-52106* New Hampshire Univ., Durham.
METHANE FLUX FROM THE AMAZON RIVER FLOODPLAIN - EMISSIONS DURING RISING WATER
KAREN B. BARTLETT, PATRICK M. CRILL (New Hampshire, University, Durham), JOSE A. BONASSI (Sao Paulo, Universidade, Brazil), JEFFREY E. RICHEY (Washington, University, Seattle), and ROBERT C. HARRISS (NASA, Langley Research Center, Hampton, VA; New Hampshire, University, Durham) Journal of Geophysical Research (ISSN 0148-0227), vol. 95, Sept. 20, 1990, p. 16773-16788. Research supported by NASA and Instituto Nacional de Pesquisas de Amazonia. refs
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Methane flux data obtained during a period of high and falling water level in the course of the dry season of 1985 (the Amazon Boundary Layer Experiment, ABLE 2A) and a period of moderate and rising water during the wet season of 1987 (ABLE 2B) were used to characterize the influence of seasonal variations in the vegetation, water column depth, and chemistry, as well as atmospheric dynamics, on the methane flux from the Amazon River floodplain. It was found that the annual estimate of methane from wetlands is identical to the annual estimate made by Matthews and Fung (1987) (both at 111 Tg). However, it was found that peatlands between 50 and 70 N contribute 39 Tg, with the large areas of forested and nonforested bogs making up 37 Tg of this figure, while the figures of Matthews and Fung were 63 and 62 Tg, respectively. I.S.

N90-14733 Michigan Univ., Ann Arbor.
THE RETRIEVAL OF THE CONCENTRATIONS OF NITRIC OXIDE AND NITROGEN DIOXIDE FROM SATELLITE SOLAR OCCULTATION MEASUREMENTS AT SUNSET AND SUNRISE
Ph.D. Thesis
CONSTANTINOS IOANNIS CARTALIS 1989 220 p
Avail: Univ. Microfilms Order No. DA8920509

HALOE (Halogen Occultation Experiment), scheduled to fly on the Upper Atmosphere Research Satellite (UARS) in 1991, aims to retrieve the vertical concentration profiles of seven minor stratospheric constituents in order to improve the understanding of ozone's photochemistry. The solar occultation method is employed for the measurement of the absorption of solar light for different altitudes. This method can effectively measure minor chemical constituents, due to the long paths solar rays need to follow before they are collected by the satellite. Once the measurements are obtained, an inversion code is applied to retrieve the vertical concentration profiles. Here, the emphasis is the retrieval of the concentrations of nitric oxide and nitrogen dioxide, which both play an active role in the photochemistry of ozone. The investigation is complicated because of their large diurnal changes which are intensified at sunrise and sunset. Consequently, the retrieval of NO and NO2 from solar occultation measurements at twilight needs to take into account the lifetimes and the rapid variations of NO and NO2. If the temporal and spatial variations of NO and NO2 are neglected, the resulting errors for altitudes less than 20 km reach 100 and 5 percent respectively and for both sunset and sunrise. A photochemical scheme is developed and a separate code calculates the photodissociation rates of the species involved in photochemical reactions, as a function of latitude, temperature, altitude and season. Dissert. Abstr.

N90-14734# NSI Technology Services Corp., Corvallis, OR. Environmental Research Lab.
CLIMATE-BIOSPHERE INTERACTIONS SCOPE OF WORK
GEORGE A. KING Sep. 1989 30 p Sponsored by US Environmental Protection Agency, Corvallis, OR
(PB90-106444; EPA/600/3-89/054) Avail: NTIS HC A03/MF A01 CSCL 04/1

Research which will be undertaken over the next 5 years is described. First, the scientific questions that must be addressed in order to answer important public policy needs concerning the potential environmental effects of global climatic change are presented. Next, the general research approaches that will be used to answer the scientific questions are described. An overview is presented of the project, as is a discussion of the relationship of the project's research with other global change research, and a budget summary. Author

N90-25411# Max-Planck-Inst. fuer Chemie, Mainz (Germany, F.R.). Div. of Atmospheric Chemistry.
GLOBAL CHANGES IN TROPOSPHERIC CHEMISTRY
PAUL J. CRUTZEN *In* ESA, Remote Sensing and the Earth's Environment p 105-113 Mar. 1990
Copyright Avail: NTIS HC A08/MF A01; also available from EPB, ESTEC, Noordwijk, Netherlands, 40 Dutch guilders

Changes in the chemistry of the atmosphere due to human intervention are described. The importance of the concentration of gases in the troposphere in maintaining the composition of the atmosphere is discussed. Due to a variety of human activities, especially through increasing emissions of CH4, CO and NOX, the concentration of tropospheric ozone and hydroxyl are increasing in the polluted and decreasing in the clean tropospheric environments. A gradual buildup of trace gases removed by reactions involving OH radicals is predicted. ESA

N90-25412# Technische Univ., Graz (Austria). Inst. of Theoretical Geodesy.
SOLID EARTH, GRAVITY FIELD AND ENVIRONMENT
HANS SUENKEL *In* ESA, Remote Sensing and the Earth's Environment p 115-123 Mar. 1990
Copyright Avail: NTIS HC A08/MF A01; also available from EPB, ESTEC, Noordwijk, Netherlands, 40 Dutch guilders

The use of geodetic spaceborne position and gravity field sensors in monitoring environmental changes is discussed. Large scale motion and deformation of tectonic plates, small scale deformation of surface structures, changes in day length and in the direction or the Earth's axis of rotation are some applications of spaceborne position and gravity field sensors in Earth observation. The need to bridge the gap between the remote sensing community and geodetic technology is stressed. The structure of the Earth's gravity field, changes in mean sea level and dynamic sea surface topography are several other examples of features which can be elucidated by geodetic techniques.
ESA

N90-27154*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
APPLICATIONS OF ISES FOR GEOLOGY
DAVID E. BOWKER *In its* Earth Sciences Requirements for the Information Sciences Experiment System p 139-143 Jul. 1990
Avail: NTIS HC A10/MF A02 CSCL 08/7

The principal applications for onboard data processing and real-time data transmission in the geological sciences are the detection of early warning signs of potential catastrophic events and the rapid assessment of impact and damage following major events. Also, the opportunity for quick look and supporting data during field investigations should not be disregarded. The Eos platforms are ideal for these applications because of the variety of earth sensing instruments and their differing modes of operation. Further study is required to define the role for each instrument and to assess how they can aid each other in establishing an improved output product. Author

N90-27190# Geological Survey of Canada, Ottawa (Ontario). Geophysics Div.
INTERMAGNET
R. L. COLES, A. W. GREEN, JR., JEAN-LOUIS LEMOUEL, and W. F. STUART (National Environmental Research Council, Edinburgh, Scotland) *In* Finnish Meteorological Inst., Proceedings of the International Workshop on Geomagnetic Observatory Data Acquisition and Processing p 113-116 15 Feb. 1990
Avail: NTIS HC A07/MF A01

INTERMAGNET is an international real time global geomagnetic observatory network. INTERMAGNET uses the existing system of geostationary meteorological satellites to communicate data from a globally distributed set of geomagnetic observatories to downlink points world wide. The satellites (GOES-East, GOES-West, Meteosat, GMS, and INSAT) provide complete coverage of the world except for the extreme polar regions. The real time data consists of high quality, three component geomagnetic observatory data with good absolute base line control and, in some cases, activity indices. These data and indices are transmitted and received at intervals of 12 minutes and 1 hour. The need for real time geomagnetic data is examined. Author

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METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

A90-10076* Cologne Univ. (Germany, F.R.).
REMOTE SENSING OF ATMOSPHERE AND OCEANS; PROCEEDINGS OF SYMPOSIUM 1 AND OF THE TOPICAL MEETING OF THE 27TH COSPAR PLENARY MEETING, ESPOO, FINLAND, JULY 18-29, 1988
E. RASCHKE, ED. (Koeln, Universitaet, Cologne, Federal Republic of Germany), A. GHAZI, ED. (CEC, Brussels, Belgium), J. F. R. GOWER, ED. (Institute of Ocean Sciences, Sidney, Canada), P. MCCORMICK, ED. (NASA, Washington, DC), A. GRUBER, ED. (NOAA, National Environmental Satellite Data and Information Service, Washington, DC), A. F. HASLER, ED. (NASA, Goddard Space Flight Center, Greenbelt, MD) et al. Symposium and Meeting sponsored by COSPAR, IAMAP, Scientific Committee on Oceanic Research, et al. Advances in Space Research (ISSN 0273-1177), vol. 9, no. 7, 1989, 479 p. For individual items see A90-10077 to A90-10136.
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Papers are presented on the contribution of space remote sensing observations to the World Climate Research Program and the Global Change Program, covering topics such as space observations for global environmental monitoring, experiments related to land surface fluxes, studies of atmospheric composition, structure, motions, and precipitation, and remote sensing for oceanography, observational studies of the atmosphere, clouds, and the earth radiation budget. Also, papers are given on results from space observations for meteorology, oceanography, and mesoscale atmospheric and ocean processes. The topics include vertical atmospheric soundings, surface water temperature determination, sea level variability, data on the prehurricane atmosphere, linear and circular mesoscale convective systems, Karman vortex clouds, and temporal patterns of phytoplankton abundance. R.B.

A90-10077
FUTURE SPACE OBSERVING SYSTEMS FOR THE WORLD CLIMATE RESEARCH PROGRAMME
P. MOREL (World Meteorological Organization, Geneva, Switzerland) and C. J. READINGS (ESA, Earth Observation and Microgravity Dept., Paris, France) (COSPAR, IAMAP, Scientific Committee on Oceanic Research, et al., Plenary Meeting, 27th, Symposium 1 and Topical Meeting on the Remote Sensing of Atmosphere and Oceans, Espoo, Finland, July 18-29, 1988) Advances in Space Research (ISSN 0273-1177), vol. 9, no. 7, 1989, p. 7-14.
Copyright

The Global Energy Water Cycle Experiment (Gewex) to assimilate data and develop models for the global energy and water cycles is discussed. The objectives and scientific strategy of the Gewex are given. The data requirements of the program are examined, including precipitation monitoring, wind measurement, clouds and radiation fluxes, and surface and near-surface properties. The role of the Gewex in the World Climate Research program is considered. R.B.

A90-10079
THE CANADIAN GLOBAL CHANGE PROGRAM
J. CIHLAR (Canada Centre for Remote Sensing, Ottawa, Canada) and M. DENCE (Royal Society of Canada, Ottawa) (COSPAR, IAMAP, Scientific Committee on Oceanic Research, et al., Plenary Meeting, 27th, Symposium 1 and Topical Meeting on the Remote Sensing of Atmosphere and Oceans, Espoo, Finland, July 18-29, 1988) Advances in Space Research (ISSN 0273-1177), vol. 9, no. 7, 1989, p. 23-27. refs
Copyright

This paper describes the proposed Canadian contribution to the International Geosphere-Biosphere Program. While the Canadian program is at the planning stage, major themes for focused effort have been identified in three domains: terrestrial-atmospheric interactions, marine-atmospheric interactions, and the Arctic region as an ecosystem. The paper further elaborates on the contribution of satellite observations to this program by outlining guiding principles and proposed remote sensing activities. Author

A90-10098 Colorado Univ., Boulder.
THE GLOBAL DISTRIBUTION OF OBSERVED CLOUDINESS - A CONTRIBUTION TO THE ISCCP
JULIUS LONDON, CAROLE J. HAHN (Colorado, University, Boulder), and STEPHEN G. WARREN (Washington, University, Seattle) (COSPAR, IAMAP, Scientific Committee on Oceanic Research, et al., Plenary Meeting, 27th, Symposium 1 and Topical Meeting on the Remote Sensing of Atmosphere and Oceans, Espoo, Finland, July 18-29, 1988) Advances in Space Research (ISSN 0273-1177), vol. 9, no. 7, 1989, p. 161-165. Research

supported by NASA and DOE. refs
(Contract NOAA-NA-80AAD00030)

Satellite-inferred overall global cloud patterns generally corroborate those derived from ground-based observations. Both show significant differences of cloudiness between the two hemispheres and over extended land as compared with ocean areas. However, the averaged latitudinal values of surface-based observed cloud amounts are about 10 percent higher than those derived from Nimbus-7 observations. The largest difference (10-20 percent) is in the subtropics of each hemisphere and at subpolar and polar latitudes during the summer. The difference in reported average global total cloud amounts is about 10 percent. Author

A90-14595
MODES OF ANTHROPOGENIC CLIMATE CHANGE [PUTI ANTROPOGENNOGO IZMENENIIA KLIMATA]
M. I. BUDYKO (Gosudarstvennyi Gidrologicheskii Institut, Leningrad, USSR) Meteorologiia i Gidrologiia (ISSN 0130-2906), Sept. 1989, p. 11-21. In Russian. refs

Possible means of limiting the present-day global warming are discussed. The climatological effects of carbon dioxide are reviewed. Consideration is given to the degree to which consumption of carbon fuel and the production of greenhouse gases should be limited. R.B.

A90-14597
EMPIRICAL ESTIMATION OF FUTURE CLIMATE CHANGE [EMPIRICHESKAIA OTSENKA PREDSTOIASHCHIKH IZMENENII KLIMATA]
M. I. BUDYKO (Gosudarstvennyi Gidrologicheskii Institut, Leningrad, USSR) Meteorologiia i Gidrologiia (ISSN 0130-2906), Oct. 1989, p. 5-14. In Russian. refs

A method for calculating expected changes in climatic conditions under anthropogenic warming is presented, which does not use theoretical climate models. Consideration is given to estimates of changes in mean air temperature and precipitation up to the year 2050. The extrapolation of empirical estimates results in a predicted rise in mean air temperature of 2.75 C from 1900 to 2050, while calculations based on theoretical models produce a predicted rise of 3-4 C for the same period. R.B.

A90-17510* Washington Univ., Seattle.
DIRECT AND REMOTE SENSING OBSERVATIONS OF THE EFFECTS OF SHIPS ON CLOUDS
LAWRENCE F. RADKE (Washington, University, Seattle), JAMES A. COAKLEY, JR. (Oregon State University, Corvallis), and MICHAEL D. KING (NASA, Goddard Space Flight Center, Greenbelt, MD) Science (ISSN 0036-8075), vol. 246, Dec. 1, 1989, p. 1146-1149. refs
(Contract NSF ATM-86-15344; NAG1-935)

Under certain conditions ships can affect the structure of shallow layer clouds. Simultaneous observations of two ship track signatures in stratus clouds from a satellite and in situ from an aircraft show that in the ship tracks the droplet sizes were reduced and total concentrations of both droplets and particles were substantially increased from those in adjacent clouds. In situ measurements of the upwelling radiance within the ship tracks was significantly enhanced at visible wavelengths, whereas radiance at 2.2 micrometers was significantly reduced. Cloud reflectivity along the tracks was enhanced at 0.63 and 3.7 micrometers. These observations support the contention that ship track signatures in clouds are produced primarily by particles emitted from ships. Author

A90-17951
CONFERENCE ON APPLIED CLIMATOLOGY, 6TH, CHARLESTON, SC, MAR. 7-10, 1989, PREPRINTS
Conference sponsored by AMS. Boston, MA, American Meteorological Society, 1989, 310 p. For individual items see A90-17952 to A90-17958.

Papers on applied climatology are presented, covering topics such as climate resources, precipitation climatology and land use planning, urbanization and rainfall distribution, climate changes, heat stress climatology, climate and culture, climate and agriculture, studies of the 1988 drought, and climatic records. Papers are included on orography and precipitation variability, climate scenarios for impact assessment, temperature changes and the greenhouse effect, the relationship between a GCM simulated climate and the observed local climate, a synoptic approach to the detection of climatic change, and climate modeling with a limited area model coupled to a GCM. Other topics include high-resolution ground-based remote sensors, the application of a spatial synoptic climatological index to changes in atmospheric NO2 and SO2 concentrations, thunderstorm and lightning relationships, satellite-derived vegetation indices as indicators of climatic variability, and the relationships between precipitation and 700 mb height patterns. R.B.

A90-17956
TEMPERATURE CHANGES IN THE MODERN CLIMATE RECORD - HOW SHOULD THIS INFORMATION BE USED TO DETECT THE 'GREENHOUSE EFFECT'?
THOMAS R. KARL and ROBERT G. QUAYLE (NOAA, National Climatic Data Center, Asheville, NC) IN: Conference on Applied Climatology, 6th, Charleston, SC, Mar. 7-10, 1989, Preprints. Boston, MA, American Meteorological Society, 1989, p. 178-183. refs

The errors, biases, and uncertainties in global and regional time series of temperature are assessed in the context of the overall trends and variability of the climate record over the last 100 to 125 years. The results are used to examined the applicability of the modern climate record for the detection of the greenhouse effect. Recommendations are made for reducing the uncertainties in the climate record and a framework for detecting the greenhouse signal in the thermometric records is proposed. R.B.

A90-19328
SYMPOSIUM ON THE ROLE OF CLOUDS IN ATMOSPHERIC CHEMISTRY AND GLOBAL CLIMATE, ANAHEIM, CA, JAN. 30-FEB. 3, 1989, PREPRINTS
Symposium sponsored by AMS. Boston, MA, American Meteorological Society, 1989, 353 p. For individual items see A90-19329 to A90-19359, A90-19361 to A90-19378.

The present conference includes sessions on cloud-climate feedback, in cloud chemistry, convective and layered cloud models, remote and in situ cloud observations, polar stratospheric clouds, and a summary on clouds, chemistry and climate. The topic areas are aimed at climatologists who try to diagnose and model the dynamics of planetary scales, at mesoscale meteorologists who focus on the circulations generated by individual clouds and cloud system interactions with the immediate environment, and at chemists who seek clues for the concentrations of chemical species and pollutants in the cloud-free atmosphere affecting the chemistry of precipitation. C.E.

A90-19340
EFFECTS OF CLOUD OPTICAL PROPERTY FEEDBACKS ON THE GREENHOUSE EFFECT OF CO2 AND OTHER TRACE GASES
GYULA MOLNAR and WEI-CHYUNG WANG (Atmospheric and Environmental Research, Inc., Cambridge, MA) IN: Symposium on the Role of Clouds in Atmospheric Chemistry and Global Climate, Anaheim, CA, Jan. 30-Feb. 3, 1989, Preprints. Boston, MA, American Meteorological Society, 1989, p. 63-66. Research supported by the Chemical Manufacturers Association. refs
(Contract DE-FG02-86ER-60485)

The cloud optical properties feedback, here referred to as

tau-feedback, is discussed in connection with the increases of the radiatively most important greenhouse gas concentration. Taking the tau-feedback into consideration, the relative contribution of other trace gases to the CO2 warming may differ from previous study results obtained without the tau-feedback contribution (e.g., Wang and Molnar, 1985; Ramanathan et al., 1985). In addition, the inclusion of multilayered cloudiness may alter the tau-feedback sensitivity studies performed by Somerville and Remer (1984). In order to delineate the tau-feedback effects, calculations have been carried out using a global, one-dimensional radiative-convective model with a standard lapse rate of 6.5 K/km. The fixed cloud altitude parameterization is used throughout these experiments, and ice-albedo feedback is included. C.E.

A90-19351
OBSERVATIONS OF AEROSOL-CLOUD INTERACTIONS IN SATELLITE-DETECTED VISIBLE AND NEAR-INFRARED RADIANCE
PHILIP A. DURKEE (U.S. Naval Postgraduate School, Monterey, CA) IN: Symposium on the Role of Clouds in Atmospheric Chemistry and Global Climate, Anaheim, CA, Jan. 30-Feb. 3, 1989, Preprints. Boston, MA, American Meteorological Society, 1989, p. 157-160. Research supported by the U.S. Navy. refs
Copyright

Through comparisons between aircraft-measured microphysical characteristics and satellite-detected radiative properties of marine stratocumulus clouds, evidence for aerosol-cloud interactions is demonstrated. Regional and global summaries of aerosol and cloud characteristics derived from satellite analysis are also presented. Advanced Very High Resolution Radiometer (AVHRR) data were used in the analysis. Cloud microphysical measurements were made with the NCAR Electra during cloud-penetrating missions in support of the First ISCCP Regional Experiment (FIRE, 1987). C.E.

A90-19352
DEVELOPMENT OF A GENERIC MULTICHANNEL ALGORITHM FOR CLOUD DETECTION USING AVHRR DATA
L. L. STOWE, R. CAREY, E. P. MCCLAIN, P. PELLEGRINO (NOAA, National Environmental Satellite, Data, and Information Service, Washington, DC), G. GUTMAN (Cooperative Institute for Climate Studies, College Park, MD) et al. IN: Symposium on the Role of Clouds in Atmospheric Chemistry and Global Climate, Anaheim, CA, Jan. 30-Feb. 3, 1989, Preprints. Boston, MA, American Meteorological Society, 1989, p. 165-169. refs
Copyright

An approach to the development of a generic cloud detection algorithm has been applied to daytime AVHRR ocean and land scenes. The initial phase was directed toward validation of the existing AVHRR cloud detection algorithms in use at NOAA/NESDIS over the ocean and also toward the investigation of whether the same modified algorithm can be used for cloud detection over land surfaces. The technical approach is discussed, including testing procedures, examples of algorithm performances over ocean and land, as well as initial interpretations of results. C.E.

A90-19357
PRELIMINARY RESULTS FROM THE PILOT PHASE OF THE INTERNATIONAL CIRRUS EXPERIMENT (ICE)
E. RASCHKE, M. LAUBE, K. D. ROCKWITZ, F. ALBERS, M. QUANTE (Koeln, Universitaet, Cologne, Federal Republic of Germany) et al. IN: Symposium on the Role of Clouds in Atmospheric Chemistry and Global Climate, Anaheim, CA, Jan. 30-Feb. 3, 1989, Preprints. Boston, MA, American Meteorological Society, 1989, p. 189-191.
Copyright

Research groups from several European countries are joining in the ICE efforts to investigate, with numerical models and analyses of satellite data, the life cycle of cirrus cloud fields. Two models are used for process studies. One considers the interaction between radiative heating/cooling, diffusional growth/decay, and the sedimentation of ice crystal. The other numerical scheme uses, in a two-dimensional geometry, the primitive equations of motion and a simplified cloud microphysics to simulate the formation and decay of cirrus. Preliminary results are presented and discussed. C.E.

A90-19361
THE INFLUENCE OF ANTHROPOGENIC CCN ON CLOUD RADIATIVE PROPERTIES
JAMES G. HUDSON (Nevada, University, Reno) IN: Symposium on the Role of Clouds in Atmospheric Chemistry and Global Climate, Anaheim, CA, Jan. 30-Feb. 3, 1989, Preprints. Boston, MA, American Meteorological Society, 1989, p. 210-214. refs
(Contract NSF ATM-84-20330; NOAA-NA-87AADCP114; EPA-R-8145230-01-0)
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Some observations of CNN and CN concentrations in maritime and continental boundary layers are reviewed in an effort to estimate the relative magnitude of the anthropogenic contribution to atmospheric CCN concentrations. It is shown, in particular, that the CNN concentration is often constant with altitude in the continental boundary layer. The data also indicate that continental air can be transported considerable distances (300 km in the particular example) over the ocean and that inland CCN concentrations are sometimes similar to maritime air. An observation is also included which demonstrates that diesel engines are a prolific direct source of CCN. V.L.

A90-19763*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
OBSERVATIONS FROM THE NASA MULTISATELLITE EARTH RADIATION BUDGET EXPERIMENT
EDWIN F. HARRISON (NASA, Langley Research Center, Hampton, VA) AIAA, Aerospace Sciences Meeting, 28th, Reno, NV, Jan. 8-11, 1990. 5 p. refs
(AIAA PAPER 90-0265)

Satellite measurements from the Earth Radiation Budget Experiment (ERBE) are providing new insights into the earth radiation balance. The ERBE results indicate that clouds have more of a cooling effect than a greenhouse warming effect on the earth-atmosphere system. The largest net-radiation cooling appears over the midlatitude oceans in the summer hemisphere where maximum sunlight and maximum cloud cover occur. The ERBE data also have shown that many areas of the earth exhibit significant diurnal variations in both longwave and shortwave radiation. In order to assess future global climatic changes, a follow-on experiment to ERBE, called Clouds and Earth's Radiant Energy System (CERES), has been selected to fly on the Earth Observing System in the the 1990's. Author

A90-21250
INVESTIGATIONS OF CHANGES IN CLIMATE AND MOISTURE EXCHANGE [ISSLEDOVANIE IZMENENII KLIMATA I VLAGOOBOROTA]
M. I. BUDYKO, ED. Leningrad, Gidrometeoizdat (Gosudarstvennyi Gidrologicheskii Institut, Trudy, No. 340), 1988, 160 p. In Russian. No individual items are abstracted in this volume.
Copyright

Papers are presented on changes in climate and moisture exchange. Results of theoretical and observational studies on changes in global climate and moisture exchange are presented together with data on the evolution of climate and vegetation. Attention is given to the major periods in the evolution of vegetation and climate in the Northern Hemisphere within the last 20,000 years, the dependence of river drainage of the European USSR and its central region on the Northern-Hemisphere temperature during climatic variations, and the migration of the Indian-Ocean climatic zones during the Miocene. Other papers are on the transmission of solar radiation in the case of nuclear war, the mobility of organic carbon in the planetary soil, and a statistical model of moisture transport in soil. I.S.

A90-21653
MONITORING GLOBAL CLIMATE CHANGE - THE CASE OF GREENHOUSE WARMING
FRED B. WOOD (U.S. Congress, Office of Technology Assessment, Washington, DC) American Meteorological Society, Bulletin (ISSN 0003-0007), vol. 71, Jan. 1990, p. 42-52. refs
Copyright

A concept for climate monitoring and reporting is proposed. The initial set of variables which would be included in the system and illustrative examples of data on these variables are given. The data are compared with the results of computer models used to project the climatic response to increases in atmospheric CO2 and other trace gases. Consideration is given to the use of the climate monitoring system to study global warming. R.B.

A90-22037 *Colorado Univ., Boulder.*
CLOUD COVER ANALYSIS WITH ARCTIC AVHRR DATA. I - CLOUD DETECTION
J. KEY and R. G. BARRY (Cooperative Institute for Research in Environmental Sciences, Boulder, CO) Journal of Geophysical Research (ISSN 0148-0227), vol. 94, Dec. 20, 1989, p. 18521-18535. refs
(Contract NAG5-898; N00014-85-C-0039)
Copyright

This paper presents a cloud detection algorithm developed specifically for Arctic AVHRR data, based on ideas of the International Satellite Cloud Climatology Project algorithm. The cloud detection algorithm was tested and validated using synthetic AVHRR and SMMR data for a 7-day analysis period and then was applied to Arctic data for January and July conditions, using the AVHRR and SMMMR data. The inclusion of SMMR passive microwave data made it possible to accurately identify the surface types and changes, allowing thresholds to be set appropriately. I.S.

A90-24726
GLACIERS OF NOVAYA ZEMLYA AND CLIMATE [LEDNIKI NOVOI ZEMLI I KLIMAT]
VLADISLAV S. KORIAKIN (AN SSSR, Institut Geografii, Moscow, USSR) Priroda (ISSN 0032-874X), Jan. 1990, p. 23-29. In Russian.
Copyright

Results of an investigation of Novaya Zemlya glaciers in 1988 is described. As a whole, the glaciation pattern of Novya Zemlya from 1913 to 1988 is shown to correspond to climate variations associated with variations of circulation types in the polar atmosphere. Despite the intensifying greenhouse effect, there is no evidence of accelerated melting of the Novaya Zemlya glaciers; rather, they appear to be developing in accordance with restructuring of atmospheric circulation. B.J.

A90-24974* Lamont-Doherty Geological Observatory, Palisades, NY.
ON TRENDS IN HISTORICAL MARINE WIND DATA
VINCENT J. CARDONE, JULIET G. GREENWOOD (Oceanweather, Inc., Cos Cob, CT), and MARK A. CANE (Lamont-Doherty Geological Observatory, Palisades, NY) Journal of Climate (ISSN 0894-8755), vol. 3, Jan. 1990, p. 113-127. refs
(Contract JPL-957647)
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Long-period variations which include a trend toward strengthening winds over the last three decades have on the one hand been suggested to be real climatic changes, and on the other artifacts of the evolution of measuring techniques. An examination is presently conducted of individual ship reports from three regions with high data densities, in order to resolve this dispute. Even with corrections for instrumental effects, the pre-1950 winds appear weaker than post-1950 winds; the most probable explanation is the absence of universal sea state and Beaufort force standards prior to 1946. O.C.

A90-25248
OBTAINING SUB-GRID-SCALE INFORMATION FROM COARSE-RESOLUTION GENERAL CIRCULATION MODEL OUTPUT
T. M. L. WIGLEY, P. D. JONES, K. R. BRIFFA, and G. SMITH (East Anglia, University, Norwich, England) Journal of Geophysical Research (ISSN 0148-0227), vol. 95, Feb. 20, 1990, p. 1943-1953. refs
(Contract DE-FG02-86ER-60397)
Copyright

The relationships between local temperature and precipitation and large-scale climate are explored using regression analysis. The predictor variables employed are area averages (over about 2.5 x 10 to the 6th sq km) of temperature and precipitation and propinquitous grid point values of mean sea level pressure and 700 mbar height, together with the zonal and meridional gradients of these two variables. Regression analyses are performed using monthly-mean data from Oregon, with separate analyses for each month. In independent verification, spatial-mean explained variances range from 58 to 87 percent for temperature and from 39 to 76 percent for precipitation. Most of the variance explained arises from the area average of the variable which is the predictand. There are large spatial differences in the amount of local climate variance that can be explained by large-scale data. Examples are given which show how site-specific changes can differ markedly from those at the grid point scale. Author

A90-25944
VARIATION IN UNITED STATES CLOUDINESS AND SUNSHINE DURATION BETWEEN 1950 AND THE DROUGHT YEAR OF 1988
J. K. ANGELL (NOAA, Air Research Laboratory, Silver Spring, MD) Journal of Climate (ISSN 0894-8755), vol. 3, Feb. 1990, p. 296-308. refs
Copyright

The present examination of variations in U.S. cloudiness and sunshine duration over the 1950-1988 period notes the year of maximum sunshine duration to have been 1988, while the years of minimum cloudiness were 1952-1956 (a 'mini dust bowl'). This discrepancy is a result of the greater long-term increase in cloudiness than any decrease in sunshine duration. In the spring of 1988, there were anomalously low cloudiness values and anomalously high sunshine duration values in the north-central, south-central, and southeast regions of the U.S. O.C.

A90-27330
THE DYNAMICAL RANGE OF GLOBAL CIRCULATIONS. II
GARETH P. WILLIAMS (NOAA, Geophysical Fluid Dynamics Laboratory, Princeton, NJ) Climate Dynamics (ISSN 0930-7575), vol. 3, Oct. 1988, p. 45-84. refs
Copyright

The influence of various hemispheric asymmetries on circulation form are studied by varying the rotation rate for axisymmetric, oblique, and diurnal GCMs. Variation of the rotation rate normalized by the terrestrial value is found to change the Rossby and Froude numbers; it also alters the scale and mix of the jets, cells, and eddies. Given these effects, the invariant features of each system can be isolated, and their quasi-geostrophic (QG) and Hadley modes can be identified. In particular, enforcing axisymmetry eliminates all QG modes and reveals the symmetric Hadley element of the moist model. O.C.

A90-28248* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York, NY.
CLIMATE CHANGE AND THE MIDDLE ATMOSPHERE. I - THE DOUBLED CO2 CLIMATE
D. RIND, M. J. PRATHER (NASA, Goddard Institute for Space Studies, New York), R. SUOZZO (Sigma Data Services Corp., New York), and N. K. BALACHANDRAN (Lamont-Doherty Geological Observatory, Palisades, NY) Journal of the Atmospheric Sciences (ISSN 0022-4928), vol. 47, Feb. 15, 1990, p. 475-494. Research supported by NASA and EPA. refs
Copyright

The effect of doubling the atmospheric content of CO2 on the middle-atmosphere climate is investigated using the GISS global climate model. In the standard experiment, the CO2 concentration is doubled both in the stratosphere and troposphere, and the SSTs are increased to match those of the doubled CO2 run of the GISS model. Results show that the doubling of CO2 leads to higher temperatures in the troposphere, and lower temperatures in the stratosphere, with a net result being a decrease of static stability for the atmosphere as a whole. The middle atmosphere dynamical differences found were on the order of 10-20 percent of the model values for the current climate. These differences, along with the calculated temperature differences of up to about 10 C, may have a significant impact on the chemistry of the future atmosphere, including that of stratospheric ozone, the polar ozone 'hole', and basic atmospheric composition. I.S.

A90-29940* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
PRECISE MONITORING OF GLOBAL TEMPERATURE TRENDS FROM SATELLITES
ROY W. SPENCER (NASA, Marshall Space Flight Center, Huntsville, AL) and JOHN R. CHRISTY (Alabama, University, Huntsville) Science (ISSN 0036-8075), vol. 247, March 30, 1990, p. 1558-1562. refs
Copyright

Passive microwave radiometry from satellites provides more precise atmospheric temperature information than that obtained from the relatively sparse distribution of thermometers over the earth's surface. Accurate global atmospheric temperature estimates are needed for detection of possible greenhouse warming, evaluation of computer models of climate change, and for understanding important factors in the climate system. Analysis of the first 10 years (1979 to 1988) of satellite measurements of lower atmospheric temperature changes reveals a monthly precision of 0.01 C, large temperature variability on time scales from weeks to several years, but no obvious trend for the 10-year period. The warmest years, in descending order, were 1987, 1988, 1983, and 1980. The years 1984, 1985, and 1986 were the coolest. Author

A90-30126
CONFERENCE ON SATELLITE METEOROLOGY AND OCEANOGRAPHY, 4TH, SAN DIEGO, CA, MAY 16-19, 1989, PREPRINTS
Conference sponsored by AMS. Boston, MA, American Meteorological Society, 1989, 334 p. For individual items see A90-30127 to A90-30214.
Copyright

Papers on satellite meteorology and oceanography are presented, covering topics such as the Tropical Rainfall Measuring Mission (TRMM), Nimbus-7 observations of climate variations, passive microwave rainfall retrievals, simulations of satellite microwave data, tropical cyclone forecasting, designs for TRMM rain radars, aircraft reconnaissance in tropical cyclone forecasting, and Special Sensor Microwave Imager (SSM/I) observations of tropical cyclone winds. Other topics include Meteosat ISCCP data on convective systems, cloud cover variations, GATE rainfall statistics, SSM/I rainfall studies, IR satellite rainfall estimates, tropical meteorology and satellite observations, moisture retrievals from the GOES VISSR Atmospheric Sounder, satellite observations of hurricanes, the GOES I-M imager and sounder, the NOAA-K AVHRR/3 and HIRS/3, and water vapor retrieval from NOAA satellites. In addition, papers are presented on remote sensing of ocean surface winds, tropical convection, surface solar irradiance variability, multispectral studies, sea surface temperature determinations, temperature and water vapor retrieval methods, wind speed measurements, and future remote sensing systems such as the Earth Observing System. R.B.

A90-35727
SCALAR FLUXES IN THE PLANETARY BOUNDARY LAYER - THEORY, MODELING, AND MEASUREMENT
JOHN C. WYNGAARD (NCAR, Boulder, CO) Boundary-Layer Meteorology (ISSN 0006-8314), vol. 50, no. 1-4, March 1990, p. 49-75. refs
Copyright

The general features of the vertical profile of the vertical flux of a conservative scalar in the planetary boundary layer are outlined, giving special emphasis to the convective case and emphasizing the importance of the Webb correction. After the influence of thermal stability on the structure of the turbulent eddies carrying this flux is reviewed, recent developments in parameterizing vertical transport in the convective boundary layer are discussed. Three approaches to the numerical modeling of this transport are surveyed: second-order closure, large-eddy simulation, and direct numerical simulation. Eddy-correlation, eddy-accumulation, and indirect techniques for measuring scalar fluxes are surveyed and contrasted. The physics of probe-induced flow distortion and its impact on scalar flux measurement are discussed, showing that it can be quite severe for trace species density fluxes measured from aircraft. Author

A90-35820* Colorado Univ., Boulder.
CLOUD COVER ANALYSIS WITH ARCTIC ADVANCED VERY HIGH RESOLUTION RADIOMETER DATA. II - CLASSIFICATION WITH SPECTRAL AND TEXTURAL MEASURES
J. KEY (Cooperative Institute for Research in Environmental Sciences, Boulder, CO) Journal of Geophysical Research (ISSN 0148-0227), vol. 95, May 20, 1990, p. 7661-7675. refs
(Contract NAG5-898)
Copyright

The spectral and textural characteristics of polar clouds and surfaces for a 7-day summer series of AVHRR data in two Arctic locations are examined, and the results used in the development of a cloud classification procedure for polar satellite data. Since spatial coherence and texture sensitivity tests indicate that a joint spectral-textural analysis based on the same cell size is inappropriate, cloud detection with AVHRR data and surface identification with passive microwave data are first done on the pixel level as described by Key and Barry (1989). Next, cloud patterns within 250-sq-km regions are described, then the spectral and local textural characteristics of cloud patterns in the image are determined and each cloud pixel is classified by statistical methods. Results indicate that both spectral and textural features can be utilized in the classification of cloudy pixels, although spectral features are most useful for the discrimination between cloud classes. Author

A90-40245* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York, NY.
POTENTIAL EVAPOTRANSPIRATION AND THE LIKELIHOOD OF FUTURE DROUGHT
D. RIND, J. HANSEN (NASA, Goddard Institute for Space Studies, New York), R. GOLDBERG, C. ROSENZWEIG (Columbia University, New York), and R. RUEDY (Central Sigma Data Services Corp., New York) Journal of Geophysical Research (ISSN 0148-0227), vol. 95, June 20, 1990, p. 9983-10004. Research supported by EPA. refs
Copyright

The possibility that the greenhouse warming predicted by the GISS general-circulation model and other GCMs could lead to severe droughts is investigated by means of numerical simulations, with a focus on the role of potential evapotranspiration E(P). The relationships between precipitation (P), E(P), soil moisture, and vegetation changes in GCMs are discussed; the empirically derived Palmer drought-intensity index and a new supply-demand index (SDDI) based on changes in P - E(P) are described; and simulation results for the period 1960-2060 are presented in extensive tables, graphs, and computer-generated color maps. Simulations with both drought indices predict increasing drought frequency for the U.S., with effects already apparent in the 1990s and a 50-percent frequency of severe droughts by the 2050s. Analyses of arid periods during the Mesozoic and Cenozoic are shown to support the use of the SDDI in GCM drought prediction. T.K.

A90-40491
COMPUTER SIMULATION OF THE GLOBAL CLIMATIC EFFECTS OF INCREASED GREENHOUSE GASES
WARREN M. WASHINGTON, THOMAS W. BETTGE, GERALD A. MEEHL (NCAR, Boulder, CO), and JEFFERY B. YOST (Illinois, University, Urbana) International Journal of Supercomputer Applications (ISSN 0890-2720), vol. 4, Summer 1990, p. 5-19. Research supported by NSF and DOE. refs
Copyright

Scientists at the National Center for Atmospheric Research have produced a visualization of the climate system and the possible climate change associated with increased greenhouse gases in the atmosphere. Through animation, the global and seasonal distribution of surface air temperature and the temporal and spatial distributions of surface temperature change by increased CO2 are shown. The geographical distribution of seasonally time-averaged atmospheric temperature difference due to the simulated hypothetical greenhouse warming is shown in a three-dimensional box with the surface soil-moisture changes superimposed in order to highlight their association. The results of the simulation of global climatic change from increased CO2 show a definite trend of warming at the surface and cooling in the upper atmosphere. R.E.P.

A90-41473#
VARIATION IN GLOBAL TROPOSPHERIC TEMPERATURE AFTER ADJUSTMENT FOR THE EL NINO INFLUENCE, 1958-89
J. K. ANGELL (NOAA, Air Resources Laboratory, Silver Spring, MD) Geophysical Research Letters (ISSN 0094-8276), vol. 17, July 1990, p. 1093-1096. refs

A 63-station radiosonde network's data for the 1958-1989 period are used to estimate global tropospheric temperature variation. Attention is given to the relationship between SST and the ENSO in the eastern Pacific, and to the question as to how ENSO activity might fit into a greenhouse warming scenario; the removal of the ENSO influence on global temperature, as presently attempted, may yield a more representative estimate of the long-term temperature changes associated with such a scenario. In view of the uncertainties, the modified temperature trace may be of greatest use in the study of shorter-term temperature variations. O.C.

A90-42382
EMPIRICAL DATA ON CONTEMPORARY GLOBAL CLIMATE CHANGES (TEMPERATURE AND PRECIPITATION)
K. IA. VINNIKOV, P. IA. GROISMAN, and K. M. LUGINA (Gosudarstvennyi Gidrologicheskii Institut, Leningrad, USSR) Journal of Climate (ISSN 0894-8755), vol. 3, June 1990, p. 662-677. refs
Copyright

New data are presented on the changes of mean global surface air temperature and annual precipitation over extratropical continents of the Northern Hemisphere. Global warming occurred during the last century with a mean trend of 0.5 C/100 years. It is shown that for the same period the annual precipitation over the land in the 35-70 deg N zone increased by 6 percent. The observed variations of precipitation coincide with the results of general circulation modeling of doubled CO2 equilibrium climate change by sign but contradict by scale. Author

A90-45605
APPLICATIONS OF WEATHER RADAR SYSTEMS: A GUIDE TO USES OF RADAR DATA IN METEOROLOGY AND HYDROLOGY
C. G. COLLIER (Meteorological Office, Bracknell, England) Chichester, England/Englewood Cliffs, NJ, Ellis Horwood/Prentice Hall, 1989, 301 p. refs
Copyright

The operating principles of meteorological radars and the procedures used to analyze and apply radar data are discussed in an introductory overview. Chapters are devoted to basic radar theory, the measurement of precipitation, weather radar networks, the contribution of radar to satellite precipitation measurements, short-period forecasting using radar data, flood forecasting, hydrometeorological studies, anthropogenic weather modification and the wet deposition of pollutants, and meteorological research. Extensive diagrams, maps, and tables of numerical data are included. T.K.

A90-50748
RESPONSE OF THE OCEAN-ATMOSPHERE SYSTEM TO EXTERNAL FORCING [REAKTSIIA SISTEMY OKEAN-ATMOSFERA NA VNESHNIE VOZDEISTVIIA]
BORIS A. KAGAN, VLADIMIR A. RIABCHENKO, and ARKADII S. SAFRAI Leningrad, Gidrometeoizdat, 1990, 304 p. In Russian. refs
Copyright

Data existing on the state of the present-day ocean-atmosphere-cryosphere-lithosphere climatic system and on its variability on the geological time scale are systematized. Special attention is given to the principles of constructing zero-dimensional, box-type, one-dimensional, zonal, and three-dimensional models of the system, as well as to the methods for studying the system's sensitivity. Results are presented on numerical experiments investigating the response of the system to changes in the land and the ocean areas, atmospheric CO2, the surface albedo, and the soil-moisture content. I.S.

A90-52095
IS RECENT CLIMATE CHANGE ACROSS THE UNITED STATES RELATED TO RISING LEVELS OF ANTHROPOGENIC GREENHOUSE GASES?
MARC S. PLANTICO, THOMAS R. KARL (NOAA, National Climatic Data Center, Asheville, NC), GEORGE KUKLA, and JOYCE GAVIN (Lamont-Doherty Geological Observatory, Palisades, NY) Journal of Geophysical Research (ISSN 0148-0227), vol. 95, Sept. 20, 1990, p. 16617-16637. refs
(Contract DE-FG02-85ER-60372)
Copyright

The relationships between recent changes in cloudiness, precipitation, temperature, and the percent of possible sunshine are examined using the results of an analysis of monthly weather records from the period 1948-1987, together with data on long-term trends (1900-1987). Several statistically significant relationships were identified for the period 1948-1987 over the contiguous United States. It is shown that the decrease in the daily temperature range observed during this period is statistically related to an increase in cloudiness (primarily due to an increase in low clouds). The reduced temperature range is a result of decreasing maximum and increasing minimum temperatures, with the maximum temperature decreasing at a greater rate than the decrease in minimum. It is noted that current models for predicting the impact of increasing anthropogenic greenhouse gases and tropospheric aerosols are inadequate to evaluate the quantitative aspects of the greenhouse effect. I.S.

A90-52123* Max-Planck-Inst. fuer Chemie, Mainz (Germany, F.R.).
PRECIPITATION CHEMISTRY IN CENTRAL AMAZONIA
M. O. ANDREAE (Max-Planck-Institut fuer Chemie, Mainz, Federal Republic of Germany), R. W. TALBOT (NASA, Langley Research Center, Hampton, VA; New Hampshire, University, Durham), H. BERRESHEIM (Georgia Institute of Technology, Atlanta), and K. M. BEECHER (NASA, Langley Research Center, Hampton, VA) Journal of Geophysical Research (ISSN 0148-0227), vol. 95, Sept. 20, 1990, p. 16987-16999. Research supported by the Max-Planck-Gesellschaft zur Foerderung der Wissenschaften. refs
(Contract NAG1-588)
Copyright

Rain samples from three sites in central Amazonia were collected over a period of 6 weeks during the 1987 wet season and analyzed for ionic species and dissolved organic carbon. A continuous record of precipitation chemistry and amount was obtained at two of these sites, which were free from local or regional pollution, for a time period of over 1 month. The

volume-weighted mean concentrations of most species were found to be about a factor of 5 lower during the wet season compared with previous results from the dry season. Only sodium, potassium, and chloride showed similar concentrations in both seasons. When the seasonal difference in rainfall amount is taken into consideration, the deposition fluxes are only slightly lower for most species during the wet season than during the dry season, again with the exception of chloride, potassium, and sodium. Sodium and chloride are present in the same ratio as in sea salt; rapid advection of air masses of marine origin to the central Amazon Basin during the wet season may be responsible for the observed higher deposition flux of these species. Statistical analysis suggests that sulfate is, to a large extent, of marine (sea salt and biogenic) origin, but that long-range transport of combustion-derived aerosols also makes a significant contribution to sulfate and nitrate levels in Amazonian rain. Organic acid concentrations in rain were responsible for a large fraction of the observed precipitation acidity; their concentration was strongly influenced by gas/liquid interactions. Author

N90-10494# National Oceanic and Atmospheric Administration, Boulder, CO. Air Resources Lab.
GEOPHYSICAL MONITORING FOR CLIMATIC CHANGE NUMBER 16 Summary Report, 1987
BARRY A. BODHAINE, ed. and RITA M. ROSSON, ed. Dec. 1988 140 p
(PB89-159628) Avail: NTIS HC A07/MF A01 CSCL 04B

Research on the geophysical monitoring for climatic change includes observatory reports and reports from the following groups: (1) aerosols and radiation monitoring; (2) carbon cycle; (3) trace gas monitoring; (4) acquisition and data management; (5) station climatology; (6) air quality; and (7) nitrous oxide and halocarbons. Work on the alkaline aerosols program (dust emissions modeling) and the Arctic gas and aerosol sampling program (springtime tropospheric ozone destruction in the high Arctic) is also reported. Cooperative programs are also discussed. K.C.D.

N90-10501# National Weather Service, Silver Spring, MD.
RESEARCH HIGHLIGHTS OF THE NMC (NATIONAL METEOROLOGICAL CENTER) DEVELOPMENT DIVISION: 1987-1988
Mar. 1989 243 p
(PB89-206478) Avail: NTIS HC A11/MF A02 CSCL 04B

During 1987 and 1988, the forecast products of the National Meteorological Center (NMC) continued to improve. Two initiatives have been undertaken to increase the interaction between university investigators and NMC scientists. In 1984, NMC established a visiting scientist program through the University Corporation for Atmospheric Research (UCAR). More recently, a second program has been established jointly with the National Science Foundation to support academic research in numerical weather prediction and to foster collaborative research between university and NMC scientists, using NMC facilities. Several major changes have been implemented into the operational models and analysis procedures in the past two years. The document summarizes these changes and the research highlights of the NMC Development Division in the following three areas: regional modeling, global modeling, and marine products. A summary of the NMC Workshop on Operational Numerical Weather Prediction Systems of the Future, held in early March 1988, is presented. Some current developments are discussed and the near-term future plans are also outlined. Author

N90-11419# National Oceanic and Atmospheric Administration, Rockville, MD. Federal Coordinator for Meteorological Services and Supporting Research.
METEOROLOGICAL ROCKET OBSERVATIONS
Dec. 1988 140 p
(PB89-168769; FCM-H10-1988;
FEDERAL-METEOROLOGICAL-HB-10) Avail: NTIS HC A07/MF A01 CSCL 04B

The handbook prescribes Federal standards for observing and reporting observations from the Cooperative Meteorological Rocket Network which provides valuable data for Federal agencies, aerospace contractors and universities concerned with diverse purposes such as the calibration and validation of data from meteorological satellites, design and reentry of space vehicles, performance of aerospace vehicles and understanding, monitoring, analyzing, and predicting atmospheric processes. The standards in the handbook apply to all agencies that participate in the network and provide a reference for users of these data. Topics discussed include the following: Metrocket systems and ground equipment; Metrocket launch and prelaunch procedures; Data reduction; coding and dissemination of rocketsonde observations; Records identification; Submission of records for publication; System performance; Manual application of temperature corrections to rocketsonde measurements; Acronyms and abbreviations. GRA

N90-18848# European Space Agency, Paris (France).
DOPPLER LIDAR WORKING GROUP REPORT
P. BETOUT, D. BURRIDGE, CH. WERNER, and T. DUC GUYENNE, ed. Jun. 1989 51 p
(ESA-SP-1112; ISBN-92-9092-096-3; ETN-90-96226) Copyright Avail: NTIS HC A04/MF A01; ESA Publications Division, ESTEC, Noordwijk, Netherlands, 20 Dutch guilders

The use of a Doppler lidar to measure wind structure, with reference to plans for launching a series of large platforms into polar orbit in the mid nineteen nineties and their possible use in Earth observation, is reported. Lack of wind data from the current observing network is addressed by the use of the Doppler wind lidar in providing full three-dimensional wind fields globally in clean air. Scientific and operational data requirements are described. The Doppler wind lidar is detailed and mission characteristics are outlined. Possible user related and technical studies are proposed. ESA

N90-20589# Lawrence Livermore National Lab., CA. Atmospheric and Geophysical Sciences Div.
AN INTERCOMPARISON OF GENERAL CIRCULATION MODEL PREDICTIONS OF REGIONAL CLIMATE CHANGE
STANLEY L. GROTCH Nov. 1989 25 p Presented at the International Conference on Modeling of Global Climate Change and Variability, Hamburg, Fed. Republic of Germany, Sep. 1989 (Contract W-7405-ENG-48)
(DE90-008325; UCRL-102793; CONF-8909308-1) Avail: NTIS HC A03/MF A01

Simulations using the best-available general circulation models (GCMs) to estimate the sensitivity of the climate to a doubling of the atmospheric carbon dioxide concentration are in broad general agreement that, at equilibrium, the global annual average surface air temperature would increase about 2 to 5 K. Because of considerable public interest in potential climate changes due to greenhouse gases, there is pressure to use the predictions of these GCM simulations for regional climate assessments. In this work, statistical intercomparisons were made of the estimates for both the control and the equilibrium changes in surface air temperature and precipitation after a doubling of atmospheric CO(sub 2) as predicted by five GCMs. Intercomparisons were also made with historical data for the simulations of current climate. Two data fields which are of particular importance in regional impact studies are examined here: surface air temperature and precipitation. The seasonally averaged results predicted by five GCMs are intercompared among models and with observational data for the control climate over different scales. Intercomparisons are also made among the models for predictions of the change at equilibrium in these two variables after a doubling of atmospheric carbon dioxide. DOE

N90-23816# Oregon State Univ., Corvallis. Energy Resources Research Lab.
THE EFFECTS OF CLIMATE CHANGE ON ENERGY PLANNING AND OPERATIONS IN THE PACIFIC NORTHWEST. VOLUME 1: OVERVIEW Final Report
JOHN E. WADE, KELLY REDMOND, and PETER C. KLINGEMAN Aug. 1989 56 p Prepared in cooperation with Bonneville Power Administration, Portland, OR

(Contract DE-BI79-86BP-63406)
(DE90-009464; DOE/BP-63406/7; BPA-89-29-VOL-1) Avail: NTIS HC A04/MF A01

This report, the first of two volumes, is an examination of Bonneville Power Administration's access to and use of climate information. Widespread concern about global warming and uncertainty about future energy scenarios underscore the influence of climate on energy planning and management. Refinement of scientific theories and computer data capabilities provide unprecedented opportunities for technical capability building and improved management decisions. BPA's decade of examining the availability and feasibility of wind energy has led to fundamental questions about the adequacy and potential of climate awareness. Volume 1 is an overview of the fingings of the research. The implications for energy planning are discussed and suggestions for further study to quantify the impacts of climate change on energy planning and operations are provided. DOE

N90-23817# Oregon State Univ., Corvallis. Energy Resources Research Lab.
THE EFFECTS OF CLIMATE CHANGE ON ENERGY PLANNING AND OPERATIONS IN THE PACIFIC NORTHWEST. VOLUME 2: TECHNICAL BACKGROUND Final Report
JOHN E. WADE, KELLY REDMOND, and PETER C. KLINGEMAN Sep. 1989 152 p Prepared in cooperation with Bonneville Power Adm inistration, Portland, OR
(Contract DE-BI79-86BP-63406)
(DE90-009465; DOE/BP-63406/8; BPA-89-29-VOL-2) Avail: NTIS HC A09/MF A01

This report, the second of two volumes, is an examination of Bonneville Power Administration's access to and use of climate information. Widespread concern about global warming and uncertainty about future energy scenarios underscore the influence of climate on energy planning and management. Refinement of scientific theories and computer data capabilities provide unprecedented opportunities for technical capability building and improved management decisions. BPA's decade of examining the availability and feasibility of wind energy has led to fundamental questions about the adequacy and potential of climate awareness. This inquiry prompted a five-month survey by Oregon State University's Energy Resources Research Laboratory (ERRL), with extensive input from the Oregon Water Research Institute and the Oregon State Climatologist. Investigators from the ERRL have worked with BPA since 1975, gaining uncommon insight to needs and concerns of utilities in general and BPA in particular. DOE

N90-23837*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
NIMBUS-7 TOMS ANTARCTIC OZONE ATLAS: AUGUST THROUGH NOVEMBER, 1989
ARLIN J. KRUEGER, LANNING M. PENN, DAVID E. LARKO, SCOTT D. DOIRON, and PATRICIA T. GUIMARAES (ST Systems Corp., Vienna, VA.) Jul. 1990 176 p
(Contract NAS5-29373)
(NASA-RP-1237; NAS 1.61:1237; REPT-90B00114) Avail: NTIS HC A09/MF A01 CSCL 04/2

Because of the great environmental significance of ozone and to support continuing research at the Antarctic and other Southern Hemisphere stations, the development of the 1989 ozone hole was monitored using data from the Nimbus-7 Total Ozone Mapping Spectrometer (TOMS) instrument, produced in near-real-time. This Atlas provides a complete set of daily polar orthographic projections of the TOMS total ozone measurements over the Southern Hemisphere for the period August 1 through November 30, 1989. The 1989 ozone hole developed in a manner similar to that of 1987, reaching a comparable depth in early October. This was in sharp contrast to the much weaker hole of 1988. The 1989 ozone hole remained at polar latitudes as it filled in November, in contrast to other recent years when the hole drifted to mid-latitudes before disappearing. Daily ozone values above selected Southern Hemisphere stations are presented, along with comparisons of the 1989 ozone distribution to that of other years. Author

N90-25400# Centre National d'Etudes Spatiales, Paris (France). Direction des Programmes.
CNES SPACE PROGRAMMES RELATED TO CLIMATE
A. RATIER *In* ESA, Remote Sensing and the Earth's Environment p 7-16 Mar. 1990
Copyright Avail: NTIS HC A08/MF A01; also available from EPB, ESTEC, Noordwijk, Netherlands, 40 Dutch guilders

The guidelines of the national and cooperative environmental programs conducted by CNES are summarized. Synergy between scientific and application projects and the promotion of innovative concepts likely to meet the requirements of the World Climate Research and International Geosphere-Biosphere programs is demonstrated. The TOPEX-POSEIDON and BEST missions are described. The implementation and definition phases of these missions are parallel to those of the WOCE (World Ocean Circulation Experiment) and GEWEX (Global Ocean Energy and Water Budget Experiment) experiments. Like the SPOT series, they are expected to provide imagery of land surfaces until the year 2000. ESA

N90-25447# National Oceanic and Atmospheric Administration, Washington, DC. Office of Research and Applications.
RESEARCH PROGRAMS: METEOROLOGICAL PREDICTION. OCEANIC PROCESSES. CLIMATE AND GLOBAL CHANGE MONITORING. SATELLITE INSTRUMENTATION AND CALIBRATION
Oct. 1989 144 p Original contains color illustrations
Avail: NTIS HC A07/MF A01

Research projects of the National Environmental Satellite, Data, and Information Service (NESDIS) are summarized from their beginning with the launch of weather satellite TIROS-1 on April 1, 1960. NESDIS, part of the National Oceanic and Atmospheric Administration (NOAA), operates the civil polar-orbiting and geostationary satellite systems for the collection of environmental data. Since 1960, successive satellites in the Improved Tiros Operational Satellite (ITOS) program have grown in sophistication, and now include concurrent multiple-channel sensing on a daily basis. The Geostationary Operational Environmental Satellite (GOES) program began in 1974. GOES satellites collect visible and infrared imagery at half-hour intervals. These images can be animated, either photographically or electronically, to provide a continuous view of atmospheric and oceanic features. Recent GOES spacecraft have carried experimental multiple channel sensors that measure atmospheric water vapor, temperature, and carbon dioxide. New spacecraft sensors, algorithms for data processing and enhancement, as well as operational analysis and applications techniques keep improving the utility of satellite data for meteorological predictions, the study of oceanic processes, monitoring resources, climate, and global environmental changes. Many of these projects are described. J.P.S.

N90-28286*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
CIRRUS RADIATIVE CHARACTERISTICS AND THE RADIATIVE IMPACT OF SMALL PARTICLES
PAUL W. STACKHOUSE, JR., GRAEME L. STEPHENS, and STEPHEN K. COX *In* NASA, Langley Research Center, FIRE Science Results 1989 p 375-379 Jul. 1990
(Contract N00014-87-K-0228; NSF ATM-88-12353; NSF ATM-85-19160; AF-AFOSR-0143-88)
Avail: NTIS HC A19/MF A03 CSCL 04/2

An understanding of the way radiation interacts with clouds is vital for understanding the sensitivity of the earth's climate to both natural and anthropogenic changes in the atmosphere. Cirrus clouds are thought to be an important modulator of climate sensitivity. The feedback effect of cirrus on climate can be positive or negative depending upon the microphysics and scattering properties of the cloud. These properties of cirrus clouds are not well understood partly because of their thin tenuous nature and partly because of their microphysical properties. The high altitude and cold temperatures within these clouds along with their transparency greatly increase the difficulty in which accurate measurements can be obtained and interpreted both by aircraft

and remote sensing. Therefore, the understanding of the interaction of radiation in cirrus clouds is crucial to determining the ways in which these clouds interact with climate forcings. The sensitivity of the radiative budgets of cirrus cloudiness to their microphysical composition and the environments in which they occur is examined. Especially important is the impact of small particles on the radiative properties of cirrus. Remote sensing estimates of the effective crystal size of cirrus and in situ measurements show large differences up to 100 microns. Thus it becomes important to identify the sources of these differences. For this reason, simulations of actual FIRE cases are compared with the in situ radiative observations and inferences are made concerning the cause of the discrepancies. Author

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OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources.

A90-10080* Technical Univ. of Denmark, Lyngby.
PIPOR - A PROGRAMME FOR INTERNATIONAL POLAR OCEANS RESEARCH
P. GUDMANDSEN (Danmarks Tekniske Hojskole, Lyngby, Denmark), F. CARSEY (California Institute of Technology, Jet Propulsion Laboratory, Pasadena), and L. MCNUTT (Canada Centre for Remote Sensing, RadarSat Project Office, Ottawa) (COSPAR, IAMAP, Scientific Committee on Oceanic Research, et al., Plenary Meeting, 27th, Symposium 1 and Topical Meeting on the Remote Sensing of Atmosphere and Oceans, Espoo, Finland, July 18-29, 1988) Advances in Space Research (ISSN 0273-1177), vol. 9, no. 7, 1989, p. 31-37.
Copyright

The Programme for International Polar Oceans Research is accepted as a part of the ERS-1 mission which will be initiated with the launch of the ERS-1 earth observation satellite by the European Space Agency in 1990. It is a bipolar program with participation by institutions engaged in studies of the atmosphere-ocean-sea ice interaction and the application of remote sensing data for operational uses. The program objectives are to develop the application of microwave data for studies and modeling of sea ice dynamics and for operational uses in sea ice infested areas. As such, it is closely connected with ongoing and forthcoming research in the Arctic and the Antarctic. With sea ice being a sensitive indicator of climate perturbations, PIPOR addresses objectives of the World Climate Research Programme. Author

A90-21486
GLOBAL CLIMATE CHANGE AND INTENSIFICATION OF COASTAL OCEAN UPWELLING
ANDREW BAKUN (NOAA, National Marine Fisheries Service, Monterey, CA) Science (ISSN 0036-8075), vol. 247, Jan. 12, 1990, p. 198-201. refs
Copyright

A mechanism exists whereby global greenhouse warming could, by intensifying the alongshore wind stress on the ocean surface, lead to acceleration of coastal upwelling. Evidence from several different regions suggests that the major coastal upwelling systems of the world have been growing in upwelling intensity as greenhouse gases have accumulated in the earth's atmosphere. Thus the cool foggy summer conditions that typify the coastlands of northern California and other similar upwelling regions might, under global warming, become even more pronounced. Effects of enhanced upwelling on the marine ecosystem are uncertain but potentially dramatic. Author

A90-39197
OCEAN RESPONSE TO GREENHOUSE WARMING
UWE MIKOLAJEWICZ, BENJAMIN D. SANTER, and ERNST MAIER-REIMER (Max-Planck-Institut fuer Meteorologie, Hamburg, Federal Republic of Germany) Nature (ISSN 0028-0836), vol. 345, June 14, 1990, p. 589-593. refs
Copyright

Changes in surface air temperature resulting from a doubling in atmospheric carbon dioxide drive changes in ocean circulation. Results from an ocean general circulation model project a global mean sea level rise from thermal expansion alone to be 19 cm in 50 years. Regional values, however, can vary: a rise of 40 cm is projected in the North Atlantic (owing to reduction of deep-water formation), whereas the level of the Ross Sea actually falls through changes in ocean circulation. Author

A90-43843
POSSIBLE FACTORS CONTROLLING GLOBAL MARINE TEMPERATURE VARIATIONS OVER THE PAST CENTURY
ZHONGXIANG WU, REGINALD E. NEWELL, and JANE HSIUNG (MIT, Cambridge, MA) Journal of Geophysical Research (ISSN 0148-0227), vol. 95, July 20, 1990, p. 11799-11810. refs
(Contract NSF ATM-89-04954)
Copyright

The relevant physical factors responsible for the global marine temperature variations over the past century are investigated using data for global night marine air temperature (MAT) and sea surface temperature (SST) for the period 1856-1988, taken from the Global Ocean Surface Temperature Atlas. Stepwise linear regression was used to relate the marine time series to the changes of solar radiation output, changes in atmospheric transmission for solar radiation, and changes in the global surface pressure field. It was found that the largest fraction of the global temperature variances are accounted for by changes in turbidity (45 percent for the MAT and 35 percent for the SST); the tropical eastern Pacific showed the largest fraction being associated with the Southern Oscillation Index. Solar irradiance variations were the second most important factor in controlling MAT fluctuations in the Southern Hemisphere. I.S.

A90-46404
POLLUTION MONITORING OF THE NORTH SEA USING NOAA/AVHRR IMAGERY
D. SPITZER, R. LAANE (Public Works Department, Tidal Waters Div., The Hague, Netherlands), and J. N. ROOZEKRANS (Koninklijk Nederlands Meteorologisch Instituut, De Bilt, Netherlands) (EARSeL, Symposium on Alpine and Mediterranean Areas - A Challenge for Remote Sensing, 8th, Capri, Italy, May 17-20, 1988) International Journal of Remote Sensing (ISSN 0143-1161), vol. 11, June 1990, p. 967-977. refs
Copyright

The importance of remote sensing for monitoring the marine environment is stressed. Model calculations predict the utility of the NOAA Advanced Very High Resolution Radiometer (AVHRR) for the synoptic assessment of the sea surface temperature (SST) and the total suspended matter concentration (TSM) over large areas of the North Sea. Data processing, algorithm development and image interpretation are described. Applications for ecological and pollution transport modeling are indicated. Author

N90-27157*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
APPLICATIONS OF ISES FOR COASTAL ZONE STUDIES
D. S. BARTLETT *In its* Earth Sciences Requirements for the Information Sciences Experiment System p 165-168 Jul. 1990
Avail: NTIS HC A10/MF A02 CSCL 08/3

In contrast to the discipline- and process-oriented topics addressed, coastal zone studies are defined geographically by the special circumstances inherent in the interface between land and water. The characteristics of coastal zones which make them worthy of separate consideration are: (1) the dynamic nature of natural and anthropogenic processes taking place; (2) the relatively restricted spatial domain of the narrow land/water interface; and (3) the large proportion of the Earth's population living within coastal zones, and the resulting extreme pressure on natural and human

resources. These characteristics place special constraints and priorities on remote sensing applications, even though the applications themselves bear close relation to those addressed by other elements of this report (e.g., oceans, ice, vegetation/land use). The discussion which follows first describes the suite of remote sensing activities relevant to coastal zone studies. Potential Information Sciences Experiment System (ISES) experiments will then be addressed within two general categories: applications of real-time data transmission and applications of onboard data acquisition and processing. Author

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A90-26284#
THE EFFECT OF CHANGES IN EDGE AND FLOW RATES ON ALTITUDE CONTROL
LAWRENCE WOLPERT, KIMBERLEY A. REARDON (Systems Research Laboratories, Inc., Dayton, OH), and RIK WARREN (USAF, Armstrong Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) IN: International Symposium on Aviation Psychology, 5th, Columbus, OH, Apr. 17-20, 1989, Proceedings. Volume 2. Columbus, OH, Ohio State University, 1989, p. 749-754. refs

Visual scenes during flight are known to decrease in 'optical activity' with increasing altitude. The effects of changes in the global optical flow rate (defined as the flight speed divided by altitude) and the edge rate (defined as the number of edges traversed per unit time) on the altitude control of the aviator are investigated using a computer to generate self-motion events for 20 naive subjects with no previous simulator or piloting experience. In all test events, which represented flight at an initial altitude of 64 ft over a flat rectangular field, subjects were asked to actively maintain an assigned altitude. It was found that changes in both flow rate and edge rate were effective in causing subjects to adjust their altitudes in accordance with the flow and edge 'forcing functions', with the effect of the former being more powerful. I.S.

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MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

A90-38801* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
EVOLUTION OF AN INTELLIGENT INFORMATION FUSION SYSTEM
WILLIAM J. CAMPBELL and ROBERT F. CROMP (NASA, Goddard Space Flight Center, Greenbelt, MD) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 56, June 1990, p. 867-870. refs
Copyright

Consideration is given to the hardware and software needed to manage the enormous amount and complexity of data that the next generation of space-borne sensors will provide. An anthology is presented illustrating the evolution of artificial intelligence, science data processing, and management from the 1960s to the near future. Problems and limitations of technologies, data structures, data standards, and conceptual thinking are addressed. The development of an end-to-end Intelligent Information Fusion System that embodies knowledge of the user's domain-specific goals is proposed. Author

60

COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing.

A90-46440
A REMOTE SENSING INFORMATION SYSTEM FOR AUTOMATIC DATA PROCESSING AND MANAGEMENT
JEAN-LOUIS AMAT (Altran Technologies, Paris, France) and YVES RABU (Matra, S.A., Saint-Quentin-en-Yvelines, France) IN: 1989 ASPRS/ACSM Annual Convention, Baltimore, MD, Apr. 2-7, 1989, Technical Papers. Volume 3 - Remote Sensing. Bethesda, MD, American Society for Photogrammetry and Remote Sensing and American Congress on Surveying and Mapping, 1989, p. 292-301. refs
Copyright

Analysis and design of a remote-sensing data processing system relying on relational databases and artificial intelligence applications to image processing is presented. A relational database design utilizes a concept of an image processing system employing a relational model allowing deductive facilities with a logic programing environment; it is interrogating, suppressing, or updating data with the help of an object-oriented structure. Image processing facilities are outlined, including different types of image-processing operators, building sequences, and image processing automation. Emphasis is placed on integration of data and processing involving man-machine interface, a deductive information system, learning, and general organization. The system is geared toward both an expert or average user to whom the processing is transparent. V.T.

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CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

N90-22302*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.
SURE (SCIENCE USER RESOURCE EXPERT): A SCIENCE PLANNING AND SCHEDULING ASSISTANT FOR A RESOURCE BASED ENVIRONMENT
NANCY E. THALMAN and THOMAS P. SPARN *In* NASA, Goddard Space Flight Center, The 1990 Goddard Conference on Space Applications of Artificial Intelligence p 105-113 May 1990
Avail: NTIS HC A15/MF A02 CSCL 09/2

SURE (Science User Resource Expert) is one of three components that compose the SURPASS (Science User Resource Planning and Scheduling System). This system is a planning and scheduling tool which supports distributed planning and scheduling, based on resource allocation and optimization. Currently SURE is being used within the SURPASS by the UARS (Upper Atmospheric Research Satellite) SOLSTICE instrument to build a daily science plan and activity schedule and in a prototyping effort with NASA GSFC to demonstrate distributed planning and scheduling for the SOLSTICE II instrument on the EOS platform. For the SOLSTICE application the SURE utilizes a rule-based system. Development of a rule-based program using Ada CLIPS as opposed to using conventional programming, allows for capture of the science planning and scheduling heuristics in rules and provides flexibility

in inserting or removing rules as the scientific objectives and mission constraints change. The SURE system's role as a component in the SURPASS, the purpose of the SURE planning and scheduling tool, the SURE knowledge base, and the software architecture of the SURE component are described. Author

66

SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N90-27440# Air Force Systems Command, Norton AFB, CA. Air Weather Service.
APPLICATION OF METEOROLOGICAL SATELLITE (METSAT) DATA TO SUPPORT UNITED STATES FORCES IN THE NORTH ATLANTIC TREATY ORGANIZATION (NATO)
ALAN L. ADAMS *In* AGARD, Tactical Applications of Space Systems 5 p May 1990
Copyright Avail: NTIS HC A07/MF A01; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Meteorological satellites play an important role in observing the environment and predicting how the environment will change with time. Such knowledge is absolutely crucial to military operations whose success or failure can often be directly influenced by changing environmental conditions. United States forces in NATO receive METSAT data from several sources and routinely use these data for operational decision making. The types of data available and the application of these data to United States Air Force and Army tactical military operations in NATO is discussed. Author

74

OPTICS

Includes light phenomena; and optical devices.

N90-24901# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Image.
ANALYSIS OF CAMERA MOVEMENT BASED ON A SEQUENCE OF IMAGES [ANALYSE DU MOUVEMENT D'UNE CAMERA A PARTIR D'UNE SEQUENCE D'IMAGE]
YIFENG WU Nov. 1989 70 p In FRENCH Prepared in cooperation with Matra Espace, Paris-Velizy, France
(TELECOM-PARIS-89-D-008; ISSN-0751-1345; ETN-90-96953)
Avail: NTIS HC A04/MF A01

Dynamic scene analysis, with particular attention given to the interpretation of speed fields is discussed. The fundamental methods and formulas used in such analysis are presented. Ways in which to decompose the parameters of movement and an analysis of the relationship between these parameters and the three-dimensional structure of the scene are discussed. A least squares method is used to solve the problem. This approach is only possible when dealing with a pure translation or a pure rotation. In general cases one must depend on iterative resolutions which present convergence and stability limitations unless the initial estimate is very good. ESA

N90-25671 Department of the Navy, Washington, DC.
OPTICAL MOTION DETECTOR DETECTING VISIBLE AND NEAR INFRARED LIGHT Patent
HOBART R. EVERETT, JR., inventor (to Navy) 20 Feb. 1990 10 p Filed 31 May 1989
(AD-D014515; US-PATENT-4,902,887; US-PATENT-APPL-SN-359249; US-PATENT-CLASS-250-221)
Avail: US Patent and Trademark Office CSCL 17/5

An optical motion detector detects changes in scene lighting indicative of motion and is also capable of detecting surveillance by active night vision devices using near-infrared light. The detector includes two photodetectors which each provide data to a signal processing network. One photodetector is sensitive to visible light; the other to near-infrared light. Both signal processing networks are identical and include a sample-and-hold, a comparator network, and a pulse stretcher. The output of a photodetector is provided to the sample-and-hold and comparator network. The comparator network compares a voltage corresponding to the instantaneously detected ambient lighting scene with a voltage corresponding to a reference lighting scene. The pulse stretcher receives the output of the comparator network and in turn provides an output to a logical processor. The logical processor compares the outputs of both signal processing networks and provides an output indicating surveillance with near-infrared light. The logical processor also indicates any perturbations in intensities of incandescent and fluorescent light. GRA

80

SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N90-13276# European Space Agency, Paris (France).
WIDER HORIZONS: POTENTIAL CONTRIBUTIONS BY SPACE SYSTEMS TO SOCIO-ECONOMIC ADVANCEMENT IN DEVELOPING COUNTRIES
NORMAN LONGDON, ed. Jun. 1989 63 p Original contains color illustrations
(ESA-SP-1106; ISBN-92-9092-028-9; ETN-89-95705) Copyright
Avail: NTIS HC A04/MF A01; ESA Publications Div., ESTEC, Noordwijk, Netherlands, 30 Dutch guilders

The main topics of the June 1989 Wider Horizons edition are: the ESA (European Space Agency) involvement with satellite applications in developing countries; generational programs in remote sensing and satellite communications in India and in Brazil; the Earth observation programs and perspectives; the Asian and African development banks. The prospects of cooperation with developing countries in the sphere of telecommunications are underlined. Concerning computer data base systems, one-off operations on a considerable scale, and operations to provide support to documentation centers are recommended. ESA

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ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

A90-13678#
SPOT AND COMMERCIALIZATION - SPIN-OFF BENEFITS
PIERRE BESCOND (SPOT Image Corp., Reston, VA) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 4 p.
(IAF PAPER 89-691) Copyright

The SPOT remote sensing system is examined as an example of a spin-off technology, and spin-off applications resulting from the use of SPOT are discussed. In particular, it is shown that SPOT is the spin-off result of the continued development of several related and unrelated technological fields that were ultimately combined into a commercial satellite sensing system. In turn, the technical capabilities and the commercial approach of the SPOT

system are driving the development of spin-off applications in such areas as mapping, resource planning, environmental monitoring, and news gathering. The commercial success of SPOT is explained by the fact that it provides a cost-effective replacement for traditional information gathering, monitoring, and mapping activities. V.L.

A90-13693#
SPOT REMOTE SENSING - A MODEL FOR SPACE COMMERCIALIZATION
PIERRE BESCOND (SPOT Image Corp., Reston, VA) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 6 p.
(IAF PAPER 89-712) Copyright

SPOT's successful development of the commercial remote sensing industry has set the standards for future systems and has established a strong foundation for future growth and market development. The basis of the system is a strong commercial perspective in every aspect of the program, from technical design, to well-defined and distinct government/private sector roles, to management of worldwise operations. Because of the unique markets and the advanced nature of the U.S. user community, SPOT's U.S. experience offers a valuable case study of the implementation of such a commercialized space program. Author

A90-30747
SPACE ENTERPRISE - BEYOND NASA
DAVID P. GUMP New York, Praeger, 1990, 227 p.
Copyright

Economic and policy issues related to the possible exploitation of space by U.S. commercial interests are examined critically. Chapters are devoted to the reasons for and implications of the loss of the Space Shuttle Challenger, the birth of the commercial space industry, rockets and spaceplanes planned for the 1990s, and the potential of low-cost space transport based on laser propulsion. Consideration is given to space production of pharmaceuticals and semiconductors, the advantages of orbital R&D programs for ground applications, terrestrial remote sensing from space, the commercial availability of the NASA Space Station, some proposed commercial stations, and the moon-Mars-LEO trade routes of the future. T.K.

A90-42660
COMMERCIAL UTILIZATION OF SPACE: AN INTERNATIONAL COMPARISON OF FRAMEWORK CONDITIONS
MICHAEL HARR (Battelle Institut, Frankfurt am Main, Federal Republic of Germany) and RAJIV KOHLI (Battelle Memorial Institute, Columbus, OH) Research supported by the Bundesministerium fuer Wirtschaft. Columbus, OH, Battelle Press, 1990, 173 p. refs
Copyright

The regulations governing commercial space activities in the U.S., Japan, France, Italy, the UK, and the FRG are surveyed, along with the applicable ESA regulations, in an updated version of a report submitted to the FRG Minster of Economics in June 1987. The major areas covered are (1) satellite-based terrestrial remote sensing and (2) microgravity applications. Consideration is given to the value and significance of (1) and (2), general requirements for space ventures, economic considerations, legal and political issues, organizational and institutional infrastructures, and specific conditions for (1) and (2) in the countries. Diagrams, graphs, and comparative tables are provided. T.K.

N90-11645# National Academy of Sciences - National Research Council, Washington, DC.
GLOBALIZATION OF TECHNOLOGY: INTERNATIONAL PERSPECTIVES. PROCEEDINGS OF THE 6TH CONVOCATION OF THE COUNCIL OF ACADEMIES OF ENGINEERING AND TECHNOLOGICAL SCIENCES
JANET H. MUROYAMA, ed. and H. GUYFORD STEVER, ed. 1988 226 p Convocation held in Washington, DC, 30 Mar. - 1 Apr. 1987
(PB89-198840; LC-88-12090; ISBN-0-309-03842-1; ISBN-0-309-03843-X) Avail: NTIS HC A11/MF A02 CSCL 05A

The proceedings contains: Globalization of industry and implications for the future; The technology revolution and the restructuring of the global economy; Global flows and barriers; Driving technologies; Information technologies in industry and society; Technological advances and challenges in the telecommunications sector; Technological advances in the construction sector; Fifteen years of major structural changes in manufacturing; Globalization of industry through production sharing; Regional and national consequences of globalizing industries of the Pacific Rim; Technology and the world economy: The case of the American hemisphere; Strategies for U.S. economic growth; and Improving the quality of life through technology. Author

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DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.

A90-49687* Versar, Inc., Columbia, MD.
THE FIFE INFORMATION SYSTEM
DONALD E. STREBEL (Versar, Inc., Columbia, MD), JEFFREY A. NEWCOMER (ST Systems Corp., Lanham, MD), JAMES P. ORMSBY, FORREST G. HALL (NASA, Goddard Space Flight Center, Greenbelt, MD), and PIERS J. SELLERS (Maryland, University, College Park) (IEEE, Canadian Remote Sensing Society, URSI, et al., Quantitative remote sensing: An economic tool for the Nineties - 1989 International Geoscience and Remote Sensing Symposium and Canadian Symposium on Remote Sensing, 12th, (IGARSS'89), Vancouver, Canada, July 10-14, 1989) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. 28, July 1990, p. 703-710. refs
Copyright

A description is given of the FIFE (First ISLSCP Field Experiment) information system, which was developed to serve FIFE investigators as a tool for designing the experiment and for organizing and manipulating the complex data set. Fulfilling these functions on an experiment-driven timeline led to abandoning the classical sequential development paradigm of software engineering in favor of a more responsive and broadly based approach. The design, development, and operation of the information system supporting the experiment had to be flexible and under direct day-to-day control of scientist/users. Because of the organization around scientific requirements, the system was able to incorporate diverse data types in a systematic way as they became available, to add scientific rigor by identifying data gaps at an early stage, and to provide real-time quality assurance. These factors are important for designing and building future databases and long-term information systems to support interdisciplinary scientific research. I.E.

83

ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

A90-13691#
REMOTE SENSING - IS THERE A MARKET, AND IF SO, HOW CAN WE DEVELOP IT
ROBERT W. SCHICK (KPMG Peat Marwick, Washington, DC) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct.

7-13, 1989. 11 p.
(IAF PAPER 89-709)

A market analysis of an advanced civil remote sensing system supported by the Department of Commerce is presented. The survey is based on assumptions by individuals from representative government agencies and industry who were asked to define and qualify future market opportunities. Supported by remote sensing experts, the study team developed assessments based on possible market scenarios reflecting current industry practices or interpreting prevailing opinion within the industry. An estimate of market needs and potential size is presented, identifying the market development barriers, most of which are well documented. The need for strategic thinking and a plan for market development are also discussed. The primary assumption is that a coordinated, concerted effort must be made if remote sensing technology is to ever reach its full potential. C.E.

84

LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

A90-38845
NOT-SO-OPEN SKIES
LEONARD S. SPECTOR (Carnegie Endowment for International Peace, Washington, DC) Space Policy (ISSN 0265-9646), vol. 6, Feb. 1990, p. 9-18. refs
Copyright

An evaluation is made of the political consequences of reticence on the part of the French and the Soviets, for reasons of commercial gain and security, respectively, to adhere to the principles of unrestricted access to earth observation satellite imagery from the SPOT and Soyuz spacecraft. This commitment to universal availability of image products has been observed by the U.S.'s Landsat operation from its inception. The ability of Landsat to set the tone on earth observation data-dissemination policies has been undercut by chronic underfunding of the Landsat operator, Eosat, after privatization of this program. While the Eosat and SPOT Image organizations have stated a commitment to unrestricted access, Soyuzcarta refrains from releasing images relating to countries in the 'socialist community', and SPOT Image has frequently favored large customers over smaller ones in the interest of profit maximization. O.C.

A90-38848* George Washington Univ., Washington, DC.
TOWARDS A COHERENT REMOTE SENSING DATA POLICY
LISA R. SHAFFER (George Washington University, Washington, DC) and PETER BACKLUND (SM Systems and Research Corp., Washington, DC) Space Policy (ISSN 0265-9646), vol. 6, Feb. 1990, p. 45-52. Research supported by NASA.
Copyright

Access to space-based remote sensing data is critical for earth science and the study of global change. This article summarizes a variety of U.S. government earth science data policies and problems. The authors examine current efforts to develop data policies for the next generation of U.S. remote sensing programs, noting likely problems based on past experiences. They argue that the goal of U.S. earth science data policy should be to provide the widest possible dissemination of data. Setting such a goal permits the development of a simple, coherent data policy that serves scientific, commercial, and U.S. government interests. Author

A90-38850
CANADIAN SPACE POLICY
JOHN KIRTON (Toronto, University, Canada) Space Policy (ISSN 0265-9646), vol. 6, Feb. 1990, p. 61-71. refs
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Canada's geography made it an early leader in the development of space technology, and generated a civilian-oriented, terrestrially focused space program with a strong focus on communications and an increasing emphasis on transferring space technology and activity from the government to the private sector. During the 1980s Canada's space program has strengthened and broadened measurably; it now contains major projects in earth observation and robotics, as well as communications, and has diversified its international partnership from the U.S. to Europe. However, persisting weaknesses in launch capability, space science, and military space programs, and the dependence of all three current major projects (Msat, Radarsat, and the International Space Station's Mobile Servicing System) on the U.S. represent potential vulnerabilities which require national investments and expanded international affiliations if they are to be offset. Author

A90-49622
THE UNITED NATIONS PRINCIPLES ON REMOTE SENSING
STEPHEN GOROVE (Mississippi, University, University) IN: Latin American Conference on International Air Transport and Activities in Outer Space, Mexico City, Mexico, Aug. 14-18, 1988, Proceedings. Leiden, Netherlands, International Institute of Air and Space Law, 1989, p. 435-453.
Copyright

The UN's Committee on the Peaceful Uses of Outer Space (COPUOS) has taken a leading role in the establishment of legal principles governing states' conduct of remote sensing. Fifteen principles were drafted over the course of many years of arduous COPUOS negotiations, and these were unanimously approved by the UN General assembly on December 11, 1986. An effort is presently made to establish the applicability and definitional setting of these principles, in order to distinguish noncontroversial ones from novel ones as well as to identify unresolved interpretational problems which may constitute impediments to the principles' incorporation into an international treaty. O.C.

A90-49623
THE LATIN AMERICAN APPROACH TO THE PRINCIPLES ON REMOTE SENSING
EDUARDO D. GAGGERO IN: Latin American Conference on International Air Transport and Activities in Outer Space, Mexico City, Mexico, Aug. 14-18, 1988, Proceedings. Leiden, Netherlands, International Institute of Air and Space Law, 1989, p. 475-493. refs
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An assessment is given of UN Resolution 41/65 (1986), concerning principles relating to earth remote sensing from space, from a specifically Latin American regional viewpoint and developing-nations economic perspective. A Resolution including compulsive jurisdiction procedures for the settlement of disputes would have been preferred by Latin Americans. Nevertheless, the consensual procedure that is used has broken the paralysis that settled over such issues after the 1979 Moon Agreement. This 'communis juris opinium' strengthens the normative space framework and diminishes the gap between fact and actual space remote-sensing activities. O.C.

91

LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

A90-22791
THE CO2 PROBLEM AND THE SPECIFIC FEATURES OF CHEMICAL WEATHERING ON MARS [PROBLEMA CO2 I SPETSIFIKA KHIMICHESKOGO VYVETRIVANIIA NA MARSE]
IU. I. SIDOROV IN: Space chemistry and comparative planetology;

International Geological Congress, Session, 28th, Washington, DC, July 9-19, 1989, Reports. Moscow, Izdatel'stvo Nauka, 1989, p. 62-70. In Russian. refs
Copyright

Outgassed CO2, H2O, and N2 inventories locked in near-surface reservoirs on Mars are considered in relation to greenhouse-effect calculations. Results suggest that extremely cold climatic conditions dominated on Mars over almost the entire period of its postaccretion history. The absence of liquid water on the Martian surface and its low-temperature determined such features of chemical weathering as its locality, its discrete character, and its maximal intensity in the past. B.J.

92

SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

A90-23665
AN EMPIRICAL MODEL OF TOTAL SOLAR IRRADIANCE VARIATION BETWEEN 1874 AND 1988
P. FOUKAL (Cambridge Research and Instrumentation, Inc., MA) and J. LEAN (U.S. Navy, E. O. Hulburt Center for Space Research, Washington, DC) Science (ISSN 0036-8075), vol. 247, Feb. 2, 1990, p. 556-558. refs
Copyright

An empirical model of variations in the total solar irradiance caused by observed changes in photospheric magnetic activity between 1874 and 1988 is presented. The model provides a remarkably good representation of the irradiance variations observed by satellite-borne radiometers between 1980 and 1988. It suggests that the mean total irradiance has been rising steadily since about 1945, with the largest peak so far at about 1980 and another large peak expected during the current solar cycle 22. But it is doubtful whether even this rise can contribute significantly to global warming, unless the temperature increase of about 0.02 C that it produces in current energy balance models seriously underestimates the sensitivity of climate to solar irradiance changes. Author

99

GENERAL

N90-13320# National Science Foundation, Washington, DC.
NATIONAL SCIENCE FOUNDATION Annual Report, 1988
1988 58 p Original contains color illustrations
Avail: NTIS HC A04/MF A01; SOD HC $4.00 as 038-000-00581-2

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N90-16706# European Space Agency, Paris (France).
FOCUS 88: THE ACTIVITIES OF THE EUROPEAN SPACE AGENCY Annual Report, 1988
VALERIE DAVID, comp. and NORMAN LONGDON, comp. Sep. 1989 60 p Original contains color illustrations
(ESA-BR-43; ISSN-0250-1589; ETN-90-96204) Copyright Avail: NTIS HC A04/MF A01

The 1988 activities of ESA are summarized. The research programs are carried out in the following areas: solar-terrestrial physics, Earth observations, microgravity, telecommunications, space transportation systems and space stations and platforms. The research activities are split into three parts: the generation of new technology needed for future missions; the program which demonstrates the flight worthiness of the systems; and the program providing in-orbit demonstration opportunities. The support areas, including satellite operations, ground facilities, technical infrastructure, data handling and archiving, are considered. ESA

N90-25932# European Space Agency, Paris (France).
SECOND MEETING OF THE SPACE AGENCY FORUM ON THE INTERNATIONAL SPACE YEAR (SAFISY)
R. SLIWA, ed. Mar. 1990 85 p Meeting held in Frascati, Italy, 2-3 May 1989
(ESA-SP-1115; ISBN-92-9092-032-7; ISSN-0379-6566; ETN-90-96980) Copyright Avail: NTIS HC A04/MF A01

The talks and papers presented at the second meeting of the International Space Year (ISY) are presented. Projects planned for the ISY by the space agencies of the different countries represented are described. The perspective of developing countries on the ISY is discussed. The proposals endorsed at the meeting include plans for extensive collaboration on such subjects as: space data for global change, global information system tests and global change outreach. The need for professional training in the methods and applications of remote sensing and natural resources development is stressed. ESA

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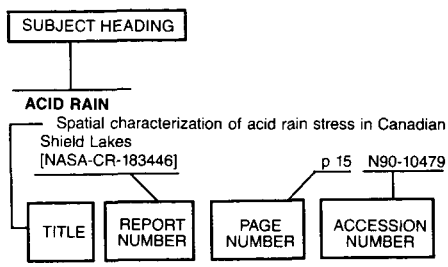

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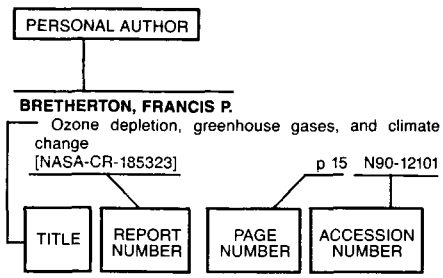

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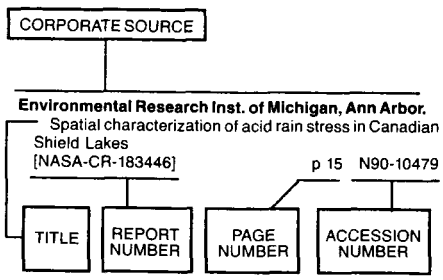

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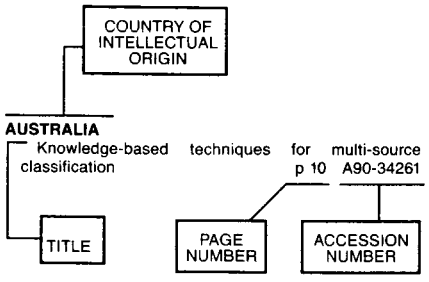

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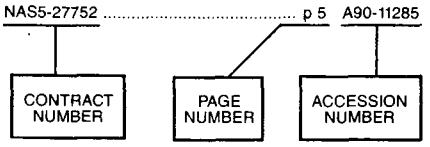

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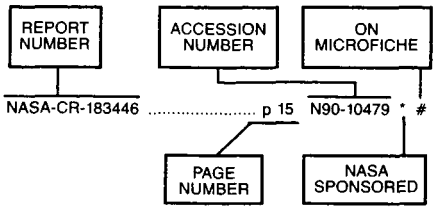

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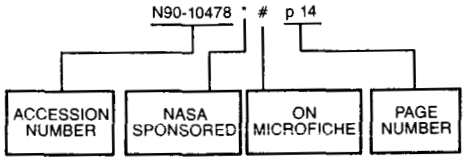

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